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Terre Haute Ind

ROSE POLYTECHNIC INSTITUTE.

ADDRESSES

OF

INAUGURATION AND DEDICATION,

WITH

MEMORIAL NOTICES,

A HISTORICAL INTRODUCTION

AND

FIRST ANNUAL CATALOGUE.



TERRE HAUTE, IND.:
C. W. BROWN, PRINTER AND BINDER.
1883.

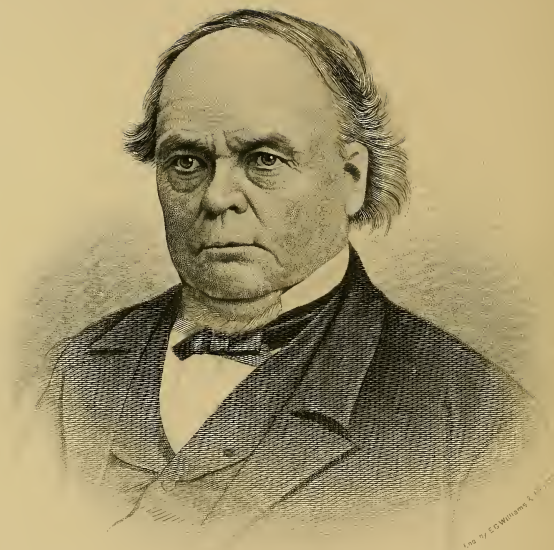
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Chauncy Rose

ROSE POLYTECHNIC INSTITUTE.

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LIST OF ILLUSTRATIONS.

PORTRAIT OF CHAUNCEY ROSE.

VIEWS OF BUILDINGS.

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HISTORICAL.

[Prepared at the request of the Board of Managers by Samuel S. Early, Secretary of the Board.]

The scientific school known as the Rose Polytechnic Institute, was founded in 1874, by the munificence of the late Chauncey Rose, of Terre Haute. As the honored life of this most generous and public spirited gentleman drew near its close, among the many benefactions that suggested themselves as deserving objects of his liberality was a school in which young men might be thoroughly trained in the sciences applicable to the industrial arts. Careful study of the plans and methods of such schools and consultation with numerous experienced educators fixed this suggestion in his thoughts, and out of his deliberations grew the establishment whose first detailed and formal publication of its progress and purposes is set forth in the following pages.

Inviting the assistance of his trusted friends, Messrs. Josephus Collett, Firmin Nippert, Charles R. Peddle, Barnabas C. Hobbs, William A. Jones, Demas Deming, Ray G. Jenckes, Gen. Charles Craft and Col. Wm. K. Edwards, he associated them with himself in a body corporate, in conformity with an act of the General Assembly of the State of Indiana, approved February 20th, 1867, and the amendments thereto, said act being entitled "An Act Concerning the Organization and Perpetuity of Voluntary Associations, and repealing an act entitled 'An Act Concerning the Organization of Voluntary Associations, and repealing former laws in reference thereto,' approved February 12, 1855, and repealing each act repealed by said act, and authorizing gifts and devises by will to be made to any corporation or purpose contemplated by this act."

On the 10th of September, 1874, articles of association were adopted, setting forth the objects of the corporation to be the establishment and maintenance, in the County of Vigo and State of Indiana, of an "institution for the intellectual and practical education of young men," designating the corporate name as "Terre Haute School of Industrial Science," and entrusting its administration to the corporators under the title of managers.

Instruction in the school was provided to be based on the practical mathematics and the application of the physical sciences to the various arts and manufactures, with other branches of active business, and was to include such training as would furnish the pupils with useful and practical knowledge of some art or occupation, and enable them to earn competent livings. Preference was to be given to students who were residents of Vigo county, moderate tuition fees were permitted to be charged, if considered necessary, and applicants for admission were required to be not less than sixteen years of age, and to be so prepared as to pass satisfactory examinations in the branches of a fair English education.

On October 10th, 1874, the Board of Managers was organized, by-laws were adopted, and the following officers elected:

President CHAUNCEY ROSE.

Vice-President . . . JOSEPHUS COLLETT.

Treasurer DEMAS DEMING.

Secretary WILLIAM K. EDWARDS.

At the same time a committee, comprising Messrs. Cruft, Peddle, Hobbs, Jones and Collett, was appointed to consider plans for carrying into effect the objects of the association.

On the 12th of December the committee reported progress, and Messrs. Peddle, Cruft and Jenckes were deputed to confer with an architect. One week thereafter Mr. Rose made his first donation, being a deed of conveyance of the ten acres of land now occupied by the Institute, and personal securities to the amount of \$100,000. The committee on architect reported conferences with Mr. Isaac Hodgson, of Indianapolis.

December 26th Mr. Hodgson was elected architect, and Mr. Rose made a further gift of \$86,000 in bonds of the Evansville, Terre Haute & Chicago Railroad Company.

By the end of January, 1875, the architect had prepared suggestive sketches, which were submitted to the consideration of Mr. Rose, and having met his approval, were adopted by the Board of Managers, and detailed drawings, with specifications and estimates of cost, were ordered to be prepared. These being in readiness by the latter part of April, on the 21st of that month they were accepted, and proposals for building were ordered to be solicited. Early in May a number of bids had been received and, after due consideration, a contract for the entire building was awarded to Messrs. McCormack & Sweeney, of Columbus, Indiana, at the total price of \$81,000. On the 9th of August, all preliminaries in the

way of gathering materials, executing bonds and contracts, and the like, having been accomplished, Messrs. C. R. Peddle, Josephus Collett, and Charles Cruft, were elected a building committee, and Messrs. Cruft, Jenckes, Nippert and Edwards were chosen as a committee on the laying of the corner-stone.

On the 11th of the following month the ceremony of laying the corner-stone took place, at 4 o'clock P. M. An immense concourse of citizens of Terre Haute, and visiting strangers, marched in procession from the center of the city to the grounds of the School, to witness the exercises, over which Gen. Charles Cruft presided, by request of the Board. When the company had been called to order, prayer was offered by Rev. E. Frank Howe, pastor of the First Congregational Church, and a choir of mixed voices sang a selection. The corner-stone was laid by the architect, assisted by the contractors and their workmen, a metal box with numerous interesting memorials of the occasion being deposited therein. The president of the day then introduced Col. William K. Edwards, who delivered an appropriate and eloquent address. A second musical selection was sung by the choir, and was followed by a masterly oration by Barnabas C. Hobbs, LL. D. The benediction, by Rev. Mr. Howe, closed the exercises.

On the same day a meeting of the Board of Managers was held, and unanimously passed amendments to the articles of incorporation, which changed the name of the association from "Terre Haute School of Industrial Science" to "Rose Polytechnic Institute." This alteration was not effected without persistent protest from the venerable founder; but the universal wish, not alone of his fellow-managers, but of the entire community of his fellow-citizens, that his noble benefaction should bear his own honored name, at length overcame his modest scruples, and he reluctantly gave his consent. Proper legal measures were also authorized to effect the transfer of the property of all kinds that had been received from Mr. Rose, from the Industrial School to the Polytechnic Institute.

The work of construction progressed apace, and by the summer of 1876 had proceeded so far that questions of purchasing appliances for heating the building began to suggest themselves. Proposals to furnish the requisite fixtures were invited, and in July the contract to supply them was awarded to Messrs. R. P. Duncan & Co., of Indianapolis, at a cost of \$8,759.00. In November of 1876 the contractors for the building had com-

pleted their work in accordance with the plans and specifications of the architect, and had added, with his approval, certain matters amounting in the aggregate to \$1,700.00. This sum was allowed them, and on the 1st of December the final warrant for their payment was drawn, the total cost of construction being \$82,700.00.

On the 27th of December Mr. Rose presented a statement of certain payments he had made for the benefit of the School, amounting to \$31,255.66, with quittance in full thereof, and at the same time transferred the sum of \$100,000 in certificates of preferred stock in the Evansville & Crawfordsville Railroad Company, as an addition to the endowment.

At the annual meeting, held on the 2d of June, 1877, Mr. Rose tendered his resignation as a member of the Board of Managers, in consideration of his great age and infirmities. In deference to his wishes, his fellow-members accepted it, but most unwillingly. Mr. Josephus Collett was elected to succeed him as President of the Board, and Mr. Charles R. Peddle was chosen as Vice-President. During the same month a contract for the building of the machine shops of the Institute (designs for which had been prepared by Mr. Hodgson) was awarded to Messrs. Clift & Williams, of Terre Haute, at a cost of \$14,400.00. Mr. Rose died on the 13th of August, 1877, and on the 17th of October the vacancy occasioned by his resignation was filled by the election of Mr. William Mack.

The total of Mr. Rose's gifts to the Institute, prior to his death, reached the sum of \$345,614.61, and embraced the following items:

Value of ten acres of land (site of the School)	\$ 20,000.00
First gift of securities	100,000.00
Second gift of securities	86,000.00
Quittance for moneys paid by him	31,255.66
Third gift of securities	100,000.00
Paid by him on account of heating apparatus	8,150.00
“ “ for grading and gravelling	208.95

By his will a specific legacy of \$107,594.34 was bequeathed to the Institute, and it was constituted his residuary legatee after the payment of his devises to his family, to the Rose Orphan Home and the Free Dispensary. What may be the exact amount to be derived from the settlement of the estate it is impossible to determine, but it is reasonable to estimate that the grand aggregate of his donations to the school will considerably exceed \$500,000.00.

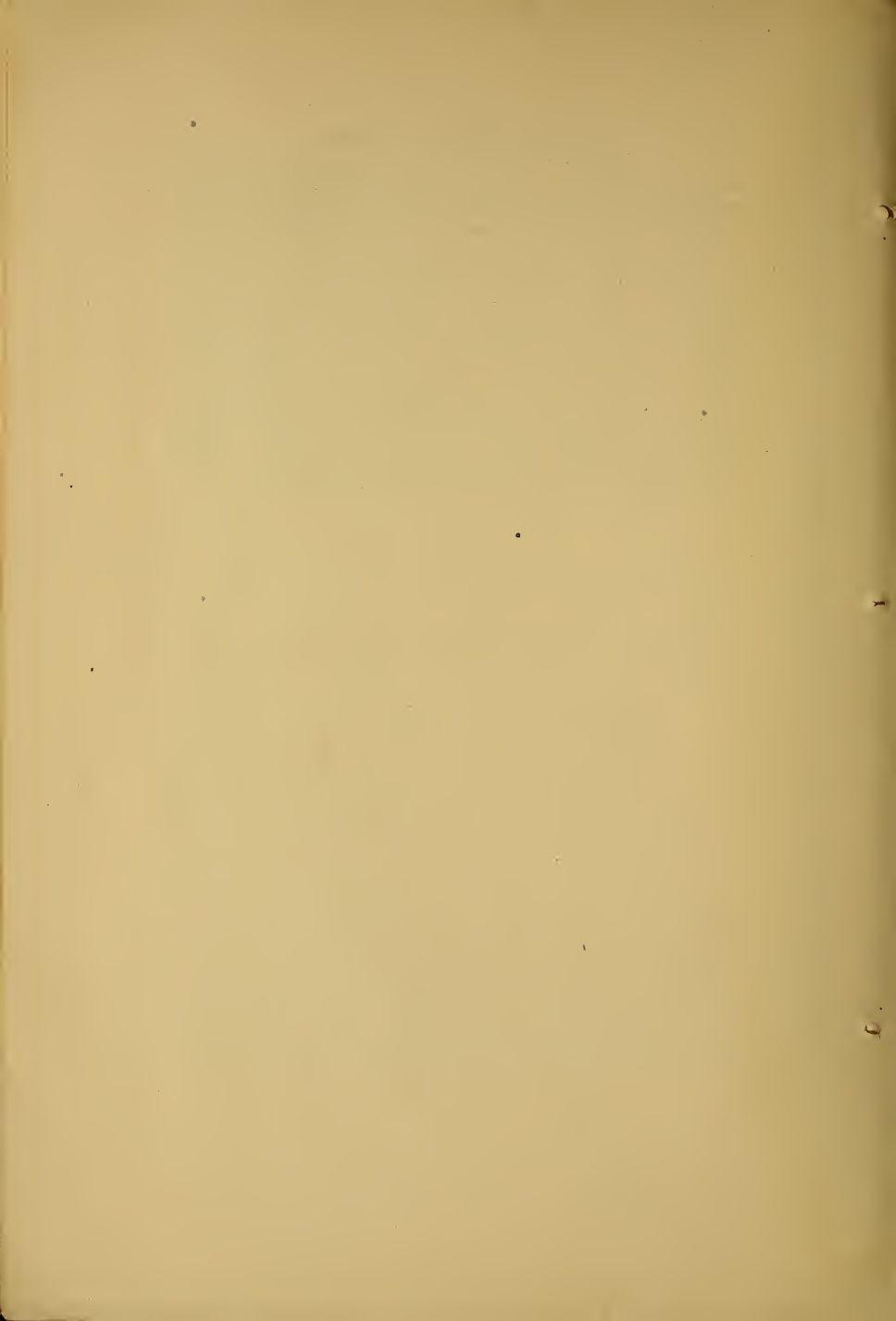
On the 26th of September, 1878, Col. Wm. K. Edwards, who had most ably and efficiently discharged the duties of Secretary of the Board of Managers from its organization, died, and Mr. Samuel S. Early was chosen, on the 2d of November, to succeed him as a member of the Board and as Secretary. Toward the close of that year the Machine Shops were finished, and some debts, which had been incurred in the various works of construction, were paid. The question then arose whether, with the means remaining at their command, the Managers could purchase the costly equipment required for the School, and have sufficient income to cover its running expenses, should it be put in operation. Committees and officers of the Board were deputed to visit the principal institutes of technology in the country, and make careful investigations concerning their appliances, methods of management and cost of maintenance. From these investigations it became evident that it would be impossible to procure the outfit without a serious impairment of the capital proposed to be retained as endowment, and at the same time, that, even after the acquisition of the equipment, the endowment fund, as it stood, would not furnish revenues sufficient for the current outlay of a school of the character Mr. Rose had desired to establish. There was no alternative, therefore, but for the Managers to defer the opening until accumulated income should supply funds for the outfit, and the settlement of Mr. Rose's estate should place at their disposal such portions of their legacy from him as would swell their permanent resources to the required amount. It was not until the beginning of 1882 that these results had been approximately attained. By that time the executors of Mr. Rose were enabled to pay the specific bequest—for the greater part in cash and productive investments, with the remainder in valuable real estate—and accrued interest had so far grown as to provide a basis for the purchase of equipment.

Pending this delay, some further changes had occurred in the *personnel* of the Board. The prolonged absence in Europe of Dr. B. C. Hobbs, as a member of the World's Peace Congress, and the removal to Mt. Vernon of Mr. R. G. Jenckes, led to the withdrawal of both those gentlemen in January, 1879, and on the 31st of that month Messrs. Robert S. Cox and Preston Hussey were elected to fill their places. Trusty custodians had been appointed to care for and protect the buildings, and small outlays made from time to time for books,

apparatus and specimens for the cabinet. Diligent inquiry had continued to be prosecuted also into the availability of candidates for the professorships of the faculty, and a number of eminent educators had been invited to visit Terre Haute and confer with the Managers upon the future organization and conduct of the School. Prominent among these had been Dr. Charles O. Thompson, Principal of the Free Institute of Technology, at Worcester, Mass., Prof. Wm. D. Marks, of the University of Pennsylvania, Prof. T. C. Mendenhall, of the Ohio State University, and Prof. F. W. Clarke, of the University of Cincinnati, from all of whom most valuable counsel and suggestions and hearty encouragement had been obtained.

Finding themselves, by the receipt of the specific legacy, possessed of funds which yielded an income of about \$25,000.00, the managers felt that the time had come when they might take the necessary measures for opening the Institute. Their first important step was the election of Dr. Charles O. Thompson, of Worcester, Mass., to the Presidency of the faculty. This occurred on the 20th of February, 1882, and the President of the Board, with the Secretary and Gen. Charles Cruft, visited Worcester for a personal conference with Dr. Thompson. Toward the end of March he accepted the appointment, and immediately began the work of selecting a faculty and preparing a detailed plan for the organization of the School. Professors of chemistry, of elementary and the higher mathematics, and of drawing, and the Superintendent of the Machine Shops, were chosen and accepted. Those whose services were necessary reported for duty so soon as their prior engagements admitted, and by the end of the summer of 1882 great progress had been made in the work of preparation. It was found that a small class could be provided for by the beginning of March, 1883, and in August of 1882 circulars were published inviting applications for admission. An opportunity for the purchase of the apparatus and library of the late Dr. John Bacon, of Harvard College, was availed of by the Board, and a most admirable collection of instruments and of scientific books was added to the resources of the School. Power, machinery, and tools for the Shop were purchased by Mr. Edward S. Cobb, the Superintendent, under the sanction of a committee composed of Messrs. Peddle, Nippert and Cox, cases for the mineralogical specimens were constructed, after the plans of Prof. Charles A. Colton, of the Department of Chemistry, and the elegant collection was

mounted, labeled and stored under his skilled labors. Shelving for the library, designed by Prof. Clarence A. Waldo, the future librarian, was provided, and the early purchases of the Board and the Bacon library were catalogued by the Secretary and arranged by members of the faculty. Large additions to the library and apparatus were made by President Thompson, who had sailed for Europe, in July of 1882, for study of the methods and progress of technological instruction in the more advanced schools abroad. Tables, easels, models, in brief, all the required appliances for the department of drawing, were procured upon the suggestions of Prof. William L. Ames, of that department, and, by the time anticipated, everything was in readiness for the opening. On the 6th of March candidates for admission were examined, and a class of twenty-five members selected from the most proficient.





WINTER HART & SONS CO.

ROSE POLYTECHNIC INSTITUTE.

INAUGURAL EXERCISES.

Arrangements for the inauguration were made by Gen. Charles Cruft and Messrs. William Mack and Robert S. Cox, a committee appointed for the purpose. On Wednesday, March 7th, 1883, at 10 o'clock A. M., the ceremonies were held, in the chapel of the Institute, in the presence of one of the largest audiences ever assembled in the city of Terre Haute. The stage and auditorium of the chapel were crowded to overflowing, and a multitude filled the halls and corridors of the academic building. The stage and speakers' stand were beautifully decorated with flowers and potted plants, contributed by Mrs. Sarah A. Heminway, a cousin of Mr. Rose, and, for many of the declining years of his life, the head of his family. On the President's table an exquisite floral ornament represented the taste and liberality of Mr. Firmin Nippert, and at the extreme right of the platform, a fine India ink portrait of Mr. Rose, executed by Brady, of New York, was wreathed with garlands of smilax.

The stage was occupied by the Board of Managers, the Faculty of the Institute, the speakers of the day, a number of the leading educators of the State, and many prominent citizens of Indiana and other States. Among them were Hon. R. W. Thompson, LL.D., and Gen. John Eaton, United States Commissioner of Education, who were the invited speakers; Prof. John M. Bloss, Superintendent of Public Instruction; Hons. George I. Reed, Murray Briggs, Joseph Gilbert, and Barnabas C. Hobbs, LL.D., of the State Normal School Board; President Lemuel Moss, of the State-University; President Emerson E. White, of Purdue University; Mayor Jas. B. Lyne, of Terre Haute; Hon. John E. Lamb, M. C.; Monsieur Louis Genis, Ing. Civ., and *Eleve* of the Royal Polytechnic School of Belgium; John R. Elder, of Indianapolis, formerly one of the Normal Trustees; President George P. Brown and Prof. E. F. Brown, of the Normal Faculty; Superintendent Wiley, Prof. Byers and Prof. Donaldson, of the city school staff; R. A. Morris and J. W. Landrum, City School Trustees; John F. Roedel, John DeBaun, and John Wilson, County Commissioners; Hon. W. R. McKeen, and Prof. J. H. Cooper, Superintendent of the Evansville Public Schools.

Promptly at the appointed hour, President Josephus Collett, of the Board of Managers, who presided on the occasion, called the assemblage to order, and the exercises began with music by Prof. Breinig's orchestra, after which the following prayer was offered by Rev. C. Pitman Croft, Pastor of the First Congregational Church:

PRAYER BY CHARLES PITMAN CROFT.

O Thou Eternal God, whose way is in the heavens, whose infinite wisdom is manifest in all the earth, whose truth is the foundation of the world, whose light and life have been given to

all men through all generations, we bow before Thee in grateful acknowledgment of all Thy gracious goodness unto us. We thank Thee for a world of brightness and helpfulness; for all our advantages and developments and inspirations.

We thank Thee for our own free and happy land, redeemed from anarchy and superstition, and won to us by the heroism and blood of godly sires; for our rich valleys and flowing rivers and great lakes—the thoroughfares of a gigantic commerce; for our mountains of silver and gold, and our mines of inexhaustible treasures. We thank Thee for the prosperity that has attended us; for the love of liberty that has made and preserved us as a nation; for peace within our borders; for all our institutions of learning; for the encouragement that has been given to art and science and literature and free thought; for all the means used to elevate the human race. We rejoice that we live in this good time, with our manifold opportunities. We remember with gratitude the men who have given their thought and energy and wealth for the world's benefit. We reap to-day the results of another's labor, and are permitted to enter into his plans.

With grateful emotions we remember our city's benefactor, whose name is on our lips at this hour—"being dead he yet speaketh." We behold these institutes about us, and rejoice in the evidence of an unselfish manhood. We thank Thee for the spirit of noble generosity that animated him—that led him to deeds of grace among us; for the help his munificence has brought to the poor of our city, for the hungry that have been fed, for the naked that have been clothed.

May there be more of this unselfish giving. May men realize the vast responsibility of wealth—the responsibility of education, of position, of power of any sort, and so dedicate themselves to the high and holy service of doing good. We thank Thee for this glad hour, which has within it rich prophecies of coming blessings to our city and our state. May this institution be a bright and shining light in all this broad West. Give wisdom to him who is placed here as its head. May his broad culture and eminent fitness make him a power over the young men in his charge. Regard all who are associated with him in the work of tuition and training, and from these halls may there go forth an army of strong and well equipped young men who shall take their places in the front ranks of earnest workers. May Thy wisdom be given to the guardians of this institution, and for all their toil and solicitude

and patient investigation may they have a rich reward in seeing the prosperity of their enterprise.

Regard our city in mercy. Crown our commonwealth with the tokens of Thy favor. Give to Thy servant, our governor, plentiful wisdom amid his arduous duties—strength to rebuke evil and courage to advance the right. May the President of these United States, and all associated with him in authority, be guided by divine wisdom, strengthened by divine grace, and may this administration be one of justice and of power. Let righteousness and peace reign within our borders. Let education and religion join hands in the common work of redeeming this world from ignorance and vice. And so may we go on to a still grander time, and Thy kingdom come in all the land. Amen.

The President then introduced Hon. R. W. Thompson, who delivered the following address:

ADDRESS OF HON. R. W. THOMPSON.

Mr. President, Ladies and Gentlemen: So little time has been allowed me to prepare for this occasion that I have not been able to exclude entirely from my mind the thoughts which ordinarily occupy it, and which are alien to those pertaining to this institution. Nevertheless, I have not felt myself at liberty to withhold whatsoever contribution it is in my power to make toward the success of its inauguration.

This institution is destined to fill a place hitherto unoccupied in this State and in the West. It should be viewed, therefore, with especial favor and pride by the citizens of this city, not only because it will become the central point from which valuable educational influences are expected to radiate, but because it had its origin in the mind of one of our most eminent citizens, and is so endowed by his magnificent liberality as to insure its complete success. We can not do too much honor to the memory of a man who, with unsurpassed liberality, rounded off a long life of assiduous industry by devoting his wealth to this and other benevolent enterprises, calculated to benefit society, alleviate suffering, and give fresh impulse to ennobling thoughts. Such a man, with philanthropic and charitable purposes like these, does far more to make humanity better and happier than those whose brows bear the crowns of royalty. His example is worth infinitely more than any set by those who are born to rank, or who climb into it through the slime of corruption—falsely imagining, when they reach it, that they have thereby added increase to their

stature. The highest earthly glory which any of us can achieve is to construct a monument for ourselves, which shall rise towards the heavens with the motto of "Good Works" graven upon its apex. Such a monument will outlive those of brass or marble, and the glittering of gold, or of the diamond, does not so charm the eye, as the remembrance of it enlivens the heart of mankind.

There is no country in the world where education is more important, both to society and individuals, than it is in our own. It is important to society because our institutions are based upon intelligence and virtue, and can not survive their loss; and to the individual, because by moulding his own personality and creating his own character, he adds to the sum of human happiness and prosperity by contributing to the general welfare. A people insensible to these considerations, from whatsoever cause—whether from necessity or inclination—are utterly incapable of rising above the condition of serfdom, and readily become the victims of the worst forms of oppression. Ignorance is, and has always been, the parent of vice, bearing a numerous and destructive progeny. Unrestrained vice fills the social atmosphere with darkness, which leaves no place for the light to enter. History abounds in such examples, and we would be left without excuse if, with these before us, we should turn back toward the old grooves from which the groans of ignorant and superstitious multitudes came forth for so many centuries.

There is a public sentiment in all American communities which places them on the side of liberal education. We see this everywhere, and derive from it a degree of consolation and encouragement which assures us of a future whereupon no cloud shall rest, but which shall extend its influence to the remote places of the earth. In this great work we have a broad field of operations before us, and must not forget what weighty responsibilities we bear. As a most important part of the great English-speaking peoples of the world, we have hitherto shown how earnestly we appreciated the fact that the work we have to do gives no room for laggards. And at every step we take in advance, we can not fail to realize how important it is that, among the soldiers who compose the army of progress, there should be no rear rank; and that when the goal is reached we shall belong to those who march in the front.

The desire for intellectual enlightenment has become one of the most conspicuous, as it undoubtedly is one of the grandest,

sentiments of this age—worth far more than any we have inherited from the earlier or even from the classical ages. It requires a retrospect of only a few years to see how much we have contributed toward the creation of this sentiment. It is within the memory of some of us when, not only were the nations far apart and without any community of interest or opinions, and, therefore, without any basis for harmony, but when portions of our own country were so far separated that they were, to each other, “terra incognita.” But, mainly by the inventive and constructive genius of our own people, has this been changed. We are now brought into the immediate presence of facts hitherto unknown, and which cause us to live within the period of a few years what was almost a whole century to the former ages. When Fulton and Rumsey harnessed down steam with “iron bands,” and Franklin chained the lightning, and Morse taught it how to speak, the nations drew closer together and began to experience that thrilling emotion which influences us “to feel each others’ woe,” and thereby makes “all the world akin.”

And not only has inventive and constructive genius done this—it has also aided the cause of science, literature, and the arts, by means of the steam printing press, which enables those who are engaged in these pursuits to make the civilized world their audience. It has lessened the labor of the farmer, the mechanic, and the artisan, by the introduction of machinery which has the delicate touch of the human finger, and an adaptability for almost every possible want. It has invaded the privacy of our domestic households, and placed within our reach every utensil which our minutest necessities require. And it has increased the vigor and added to the industry of the advancing nations, so that they have become emulous rivals of each other in the work of improving the condition of mankind.

Nothing deserves our admiration more than the genius which provided these grand results; and that system of education which shall incite it to yet higher and bolder flights, by opening the field for new discoveries and inventions, possesses a value which can not be computed. I do not stop now to speak of other methods of education—of those furnished by our universities, colleges, academies, and common schools. Each of these has its own work to do, and an orbit of its own within which to move. Combined, they make up a system of education absolutely indispensable;—without which the professions could not be supplied, literature

would become effeminate, art would deteriorate, industrial pursuits be paralyzed, commerce be withdrawn from the seas, and the reign of ignorance and vice would set in.

The system of education to which I desire more especially to refer, is that which is about to be inaugurated in this institution. A polytechnic school is one wherein the physical sciences are taught, in order that a familiarity with nature may be acquired, and her wonderful laws understood. It has its controlling idea in the fact that the objects of nature are susceptible of scientific analysis; and, starting at this point, as its initial step, it deals with these objects until all their qualities are perceived, their capacity for combination observed, and their uses ascertained. It is not content to witness merely the effect produced by natural laws, but seeks to comprehend the methods of their operations, so that existing results may be ascertained and new ones worked out. The necessity for this method of education is perfectly apparent. We see, every day, the effects of natural laws without comprehending how they are produced. The object of this school is to furnish the means of solving these problems, which, to us, are so mysterious, and to make us, not only familiar with natural objects, but enable us so to employ and combine them as to produce artificial results beneficial to mankind. We all know that ships are propelled through the sea, that trains of cars are drawn over mountains, that machinery is moved, and that water is lifted from the earth, by steam. We have become so accustomed to these things that they seem to have come to us as a matter of course, and without any effort on the part of inventive and constructive genius to produce them. Yet, who can tell how many hours of weary labor were spent, how many sad disappointments were encountered, in their pursuit, and how much deep study and reflection preceded the achievement of these wonderful results? They are accomplished facts now, and as such are familiar to everybody; but I can well remember the time when the foretelling of them was regarded as delusion. They were not produced merely by the teaching of the classics, by familiarity with the dead languages, by literary culture, by the solution of mathematical and algebraical problems, or by the special and scientific culture of universities, colleges, academies and common schools. From these an amount of general intelligence has been derived which exhibits its beneficial results in a thousand ways throughout all the departments of society. But these have not pointed in the direction of discoveries in

physical science or mechanical inventions. They point rather to conspicuous places, in public or private life, which are likely to assure the approbation and applause of the world. Whereas, those wonderful results which have already startled the world, and such others as are startling it afresh every day, have reached their development in quiet and retired places, away from the gaze of the public, and unknown entirely except to those whose mechanical skill it is necessary to employ. General and classical education have lifted the mind to a high intellectual plane, but have not produced such fruits as have been borne by the grand harvest of invention. For these we are indebted to that adventurous, and at the same time, inspiring genius, which leads its possessors out into the great store-house of nature, where, becoming familiar with its wonderful laws, it has been enabled to surmount difficulties in the presence of which the most refined literary learning, the most acute philosophical perception, the highest professional skill, and even the most entrancing eloquence, all stand abashed. The system of polytechnic teaching penetrates the arcana of nature, among which, scattered here and there in promiscuous heaps, there lie innumerable things which it gathers up for practical use, and which, without it, would be of little or no value to the world. I do not pretend to scientific or accurate classification, but if allowed, I would say that this system furnishes the focus of concentration for science and art—the point where they blend in harmonious accord, as the scattered rays of the sun are gathered by the convex lens. We call this point technology, not because it is a science by itself, but because it seizes upon and appropriates the truths and demonstrations of all the sciences, of all art, and so directs and moulds them into harmony, that new combinations may occur, new results be wrought out, and new incentives to genius be created. The universities, colleges, academies and common schools, furnish us with the elementary and fundamental principles, which the science of technology, in the polytechnic school, fashions into every practical result, of which, by possibility, they are susceptible. They go out into the woods and fields, upon the mountains, down into the sea and the mines, and classify the timbers, and the soils, and the minerals, and the sea shells, and the animal remains and the plants, even so far back as the prehistoric times; and technology avails itself of all this in order to demonstrate the multitude of uses to which this vast accumulation of natural materials may be applied. They ascertain the difference

between the centrifugal and centripetal forces,—that is, that the one flies from and the other is drawn to the center,—and technology, availing itself of the discovery, so constructs the governor of the steam engine as to demonstrate the former by the revolutions of the shaft, and the latter by arresting its velocity. They teach that a vacuum is an empty space, and technology makes it practically appear that the impelling force in the condensing engine is produced by the difference between the pressure of the steam above and the pressure of the vacuum below the piston. They instruct us that there are single-acting, rotative, and rotatory engines; and technology steps in to assure us which is the best for the purposes designed, by showing how a rotative motion is produced, and how the position is changed from a rectilinear into a circular motion. We learn from them the elementary constituents of fuels, and that there must be a development of heat and light to produce combustion; and technology comes to our aid by instructing us whether the single or double-acting engine is most suited to force air into furnaces for smelting iron. They point out to us that carbon and hydrogen are the chief combustible constituents of fuel, and that their chemical combination with the oxygen of the atmosphere is the source of heat; and technology designs, at once, a method by which to ascertain how many cubic feet of steam of the atmospheric pressure can be produced by a cubic inch of water; how steam expands, contracts, and acts upon the valves of an engine; how it may be put on and shut off from the cylinder, whether at or before the end of the stroke; when the exhaust passage for its escape from the engine should be opened; and how the thousand other matters of detail necessary to create and control this powerful element bear relation to each other and to that wonderful piece of machinery known as the steam engine,—the great revolutionizer of the age. And thus the science of technology, although mainly derivative in its character, has become one of the most important of the sciences, because there are demands, every day, for new inventions, new combinations of materials, and new enterprises, so that the world, as it grows older, may show no signs of decrepitude, but keep on in the steady course of its progress, until, among the great brotherhood of nations, there shall be no discord, and, among all the peoples of the earth, happiness shall be within the reach of all, and universal peace shall prevail.

There is therefore no antagonism, or room for it, between

existing educational institutions and a polytechnic school like this. They belong to the same family, draw inspiration from the same fountain, and should dwell together in concord around the same altar. They are twin sisters. Technology does not repudiate the abstract sciences. On the contrary, it recognizes their demonstrations and applies their truths. It takes them up at the point where they have reached their highest theoretical development, and causes them to serve practical and indispensable uses—to the production of results which would otherwise remain unknown. It is such an auxiliary as the abstract sciences should seek after, so that, neither repelling the other, the two should constitute a harmonious whole. And it is because this feature in our system of education will be exhibited in the progress of this institution, that it commends itself, in an eminent degree, to the public approbation. The public need the existence of such a school, and are to be congratulated upon its establishment under existing auspices. In view of its origin, its location, the character of our people, the sagacity of its managers, and the eminent fitness of its faculty, I may be allowed to say, as we sometimes do of individuals, that it is the right school in the right place.

Why may we not assure to ourselves the advantages which others have enjoyed from technological teaching in polytechnic schools? France, under whose national auspices they were first established, less than a century ago, with a view chiefly to the education of civil and military engineers, has been greatly benefited by them. They have enabled her engineers to occupy positions in the front rank among the most distinguished in the world. These, by thorough explorations, have succeeded in mapping out with great particularity, all her material and natural resources. By this means, and by the scientific classification of her soils, and her mineral and vegetable products, she has been enabled to understand the nature and extent of her own resources, and to shape her policy and industries so as to develop them to the utmost. Her wonderful success in this is seen in the facts that wealth and the means of subsistence are more equally distributed in France than in any other European state, and that almost every foot of earth is made to contribute to the prosperity of a people to whom emigration is not necessary, as in neighboring nations, in order to better their material condition.

Our natural resources are many hundred fold in excess of those of France. One only of our states, out of thirty-eight, contains

70,000 square miles more of territory, and our whole area is more than seventeen times greater. There is not a single natural product to be found within the degrees of latitude that mark our extent which we do not possess. They are scattered about in every direction in rich profusion—here, there, and everywhere. Already has their development astonished the world, and ourselves also; and what we shall need in the future is to see that nothing shall occur to arrest or check it, but, on the contrary, that everything shall be done to accelerate its progress.

We have occupations enough for all—fields of adventure and enterprise widening out every day—inducements for the employment of our best energies and our most ennobling faculties. Our whole population is thirsting for knowledge, in all the varieties of its forms. They read more books, and magazines, and newspapers, than any other people. These great educators are tireless in the work of enlightenment, and he who does not learn something every day may well exclaim, like the Roman Emperor, "*perdidi diem*—" I have lost a day! Our young men are standing ready, with the courage of veteran soldiers, panting to leap to the front whensoever any adversary to our progress, material or intellectual, shall appear. They have the right to demand that those of us who are passing away, and whose places they will soon fill, that we shall not withhold from them the proper weapons with which to carry on the battle of life—a battle that will require all the courage and fortitude they can command.

Among the weapons for this conflict none are so effective in the production of good results as enlightened intelligence, which enables its possessor to appreciate the character and importance of passing events, and to derive wisdom from their teachings.

It was thus that the founder of this institution reasoned in his lifetime. He was anxious that the young men of this state, and especially those of this vicinity, should not fall behind in any sphere of duty to which they might be called. And, desiring them to perform their share in the great work of the future, he established this school as the means of enabling them to do it manfully and well. It is a gift to the country, and a legacy to them, worth more than gold. It is a priceless inheritance. Who can measure the extent of the good it is destined to accomplish? Who can tell what shall be the extent of its contributions towards such a material development of this country as shall compare with that produced, by like means, in France? We know

now that its first steps are well taken, and in the right direction towards complete success; and the character and qualities of those who manage its affairs, give the best assurance that this success will be won. Then, if it shall be allowed by Providence that the spirit of its generous founder shall look back upon the scenes of this life, his immortal soul will exult at the thought that his methods of diffusing beneficent influences amongst men were well conceived, and have been faithfully executed.

MEMORIAL NOTICE OF CHAUNCEY ROSE.

It is appropriate to this occasion that I add a few words with special reference to Chauncey Rose, without whose generous-hearted liberality these ceremonies could not have transpired. Like a few others in this audience, my personal intercourse with him embraced a period of more than the third of a century. During this time I had many opportunities to observe his leading characteristics, and to become familiar with the structure of his mind and the tendency of his thoughts. He was emphatically self-made, and owed nothing to the mere adventitious circumstances of life. Having commenced life without the favors of fortune, one of the first lessons he learned was self-reliance, from which grew that indomitable courage which constituted one of the most conspicuous elements of his character. His character, therefore, was his own creation, and was well and symmetrically built up. It was moulded in an important degree by the incidents of a frontier life with which he participated. He became a citizen of this county about two years after the state constitution was formed, and the year in which this city was selected as the county seat. The population, at that time, was very small, and I know of but two now living in Terre Haute who were then here. The fact that he sought the adventure of a country entirely new, and was willing to contend against its hardships, which were numerous and scarcely conceived of by the present population, was proof that he was courageous. He had many occasions, in the course of a long life, to exhibit this quality, and I am quite sure that, upon none of them, was he ever known to fall below its requirements. I do not mean mere animal courage, but that of a higher and nobler type—such as is the product of honest and intelligent convictions. This may be justly said to have been the base upon which the whole structure of his character was built, and it enabled him, upon all occasions of business or social intercourse, to impress his thoughts and

opinions upon others. It was impossible not to see that he believed and meant what he said, and that his whole conduct was the result of honest conviction. This was, undoubtedly, the case with him, so conspicuously and to such a degree, that even those who did not agree with him, were ready to concede that whatsoever opinions he expressed were honestly entertained. And thus it was that he acquired a reputation for integrity upon which no aspersions were ever cast.

In his business transactions he always displayed great sagacity, and was scrupulously exact. His mind was well balanced, and his judgment generally accurate, both as regarded men and things. He read a good deal, and was a careful observer of passing events, which he analyzed with great thoroughness. He was, therefore, among the earliest of those who foresaw the growth and prosperity of this city and county, and, indeed, of the state. These were always favorite topics with him, and so decided were his convictions with regard to them that he was always ready whensoever the occasion presented—or to create an occasion when none existed—to assist in all measures tending to these ends. When the charter for the Terre Haute & Richmond (now the Terre Haute & Indianapolis) railroad was first obtained, it was considered a matter of great doubt whether the money necessary for its construction could be obtained, as money, in those days, was not so plenty as it is now. A convention was assembled at Indianapolis to consider what steps should be taken, and it was there proposed that an effort should be made to obtain a grant of lands from the United States sufficient for the purpose. A majority of the convention were disposed to favor this proposition, but Mr. Rose made such stern opposition to it that it was finally abandoned—showing in this the power and strength of his will. His defeat of the project created in his mind an impression that, if the enterprise should afterwards fail, a large share of the responsibility would rest upon him. And this consideration, added to his great anxiety for the construction of the road, stimulated him to extraordinary personal exertions, which he immediately put forth with so much energy and perseverance that the money was raised by individual subscriptions, and the road built—mainly by his efforts and with capital furnished by him. But for him it would not have been then built, and but for him it would not have been so well built as to have become what it now is and has always been, one of the best and safest railroads in this country. He caused it to be con-

structed as he did everything else in which he participated—being governed by the rule that whatever was worthy of being done at all, should be well done.

He acquired the reputation of being what is popularly called a "railroad king," and if to have been one of the foremost and most conspicuous among the pioneer advocates of that kind of improvement entitled him to be so known, the title was properly given him. He contributed very largely to the railroads from Evansville to Terre Haute, from Terre Haute to Crawfordsville, and from Terre Haute to Danville, Illinois; all of which are more indebted to him for their construction than to any other individual. He advocated zealously, for many years, a railroad from Terre Haute, through Illinois, to St. Louis, and expended money liberally in making experimental surveys. But his advancing age admonished him that it was necessary for other and younger men to carry out this important scheme, and he was content to see what he had done made available finally in the construction of the St. Louis, Vandalia & Terre Haute Railroad, now a part of the Vandalia line.

Mr. Rose was a resolute man. In all the enterprises in which he engaged he displayed this quality, and, in consequence, generally achieved success in what he undertook. His strong will enabled him to influence others and to impress them with his opinions. It was this which gave him his own earnestness and untiring activity in pursuit of the objects he desired to accomplish, for it is one of the inexplicable laws of the human mind that its own vigor and energy is increased in the same proportion as it imparts them to others. To others he could not be unfaithful, because he was true to himself. And as he always acted with strict fidelity to his convictions, he pursued the line of duty, as he conceived it, with unfaltering purpose.

The accuracy of his judgment in business affairs enabled him to make judicious investment of his means, and this resulted in the accumulation of his large estate; which, when acquired, he seemed to consider as being held by him in trust for the public, and as imposing upon him obligations which grew out of his relations to society. Thus he dispensed many private charities which were unknown to any except the recipients and himself, in which quiet field of benevolent operations he kept alive and invigorated the sentiment of philanthropy, which grew and increased as the circle of his good works was enlarged. For some years before his

death his mind was greatly exercised in determining the most suitable method of so distributing his property that the public should be benefitted by it—especially that part of the public where he had lived so long, where he had formed many friendships, and where his wealth had been acquired. He had strong sympathy for those who have to struggle, without fault, against the tide of adverse fortune which overwhelms so many victims. This became a fixed sentiment in his mind, so that the consciousness of having relieved the suffering of the meritorious poor gave him always intense gratification. Our citizens all know how many evidences of this were, from time to time, given by him. By his munificent gift to the Ladies' Aid Society of this city he has enabled it, under the admirable administration of its managers, to become a noble and magnificent charity. His donations to Providence Hospital were upon a most liberal scale. The medical dispensary which he established in this city, and where the poor are to be provided for without charge, is a work of Christian benevolence. And added to these, and others less conspicuous, there is the Orphan Home, with an endowment sufficient to assure its permanency, which, of itself, is enough to confer immortal honor upon his memory.

He took deep interest in the cause of education generally. But that kind of education most suitable for young men of genius, talents and enterprise, and which should fit them for the highest spheres of practical life, was, with him, a favorite topic of thought and conversation. His leading idea was that a system should be provided that would blend the industrial sciences with the branches of knowledge usually taught in the schools and colleges, so that the pupils should not only become scholars in the ordinary sense, but should be enabled to follow the various mechanical, professional, and industrial pursuits with intelligence and skill. He desired to build up a class of educated and scientific mechanics and laboring men, so that, in the pursuit of their various vocations, they should be able to give full scope to their inventive and constructive talents. In furtherance of his general purpose he gave, from time to time, liberal contributions to Wabash College, at Crawfordsville. He also furnished the means of adding essentially to the library of the State Normal School, in this city; and paid the expenses of a considerable number of young ladies while fitting themselves at that school to become teachers. And at last, his leading and long cherished thought

with reference to education, culminated in the grand and noble bequest which has caused the erection of this building and the establishment of this polytechnic school. His various gifts in this vicinity and state, for these philanthropic purposes, exceed a million of dollars.

Mr. Rose exhibited a prominent and leading trait of his character in dealing with the estate of one of his brothers who died in New York, leaving a large fortune. He found, after the death of his brother, that his will made bequests of more than a million of dollars to various charities, but that they were so made as to place the control of the funds in the hands of public officials in whose integrity he had no confidence. Investigation satisfied him that they would be, in all probability, squandered and lost, if the will were executed according to its provisions, and that, by this means, the benevolent objects of his brother would not be accomplished. He, accordingly, instituted legal proceedings to set the will aside, and, after tedious litigation, succeeded in doing so. Thus he inherited in his own right and as the heir of his brother, the large sum disposed of by the bequests of the will. This would have put the character of almost any man to a severe test, and a very large majority of men would, without hesitation, have appropriated the money to their own use. Not so, however, with Mr. Rose. It required no deliberation on his part to decide that justice to the memory of his brother and to his own character, required that the money should be disposed of by him so as to execute the objects provided for in the will, as far as possible. As the representative of his brother, therefore, voluntarily—and without any compulsion—he did this, by disposing of the money in New York for charitable objects, such as the Newsboys' Home, the Institution for the Relief of the Ruptured and Crippled, and others of like character. For all those he also gave more than a million of dollars.

Few men have left so many evidences of a humane and philanthropic spirit, or have bestowed their charities more wisely. There is an entire absence of anything like selfishness in each one of them, and so quietly were many of them dispensed that the public knew nothing of them until their fruits were observed. As his own conscience guided him, and he needed nothing more than its approval, he did not seek after notoriety, or what the world calls fame. As it was impossible to shake his purpose when it became fixed, so it was always executed without regard to mere

applause. As he deliberated well and intelligently before acting, and followed the counsel of his own convictions, so he left his acts to speak for themselves, as they now do with eloquence which no words can imitate.

The many who have already been relieved by his benevolence will unite in the bestowal of blessings upon his memory. Hundreds of others yet to come, who shall share the benefactions he has so bountifully provided, will repeat his name with sincere and heartfelt praises. But there will be none louder or more earnest in this than the recipients of the blessings which shall flow from this school, whose foundations he has laid with so much wisdom and foresight, and around which his affections clustered with the most intense ardor of his nature.

As one of the survivors in that circle of which he was for so many years a conspicuous part—a circle growing smaller and narrower every day—it is only left for me to say, in closing my part of these performances, that as I knew him in life to possess integrity which no temptation could shake, and honesty which no tongue ever assailed, I join, earnestly and heartily, in whatsoever expression of praise his character and his deeds of love, of mercy, and of benevolence, shall call forth. May the noble charities of his long life continue to shed their benignant influences upon society when we, too, have passed away. May his earthly remains sleep gently in the narrow sepulchre of the dead. And may his immortal spirit, freed from the shackles of earth, dwell forever in that "house not made with hands, eternal in the heavens," where the good deeds of a well-spent life are rewarded by the dispensations of a God whose love is as boundless as eternity, and whose "mercy endureth forever."

Gen. John Eaton, United States Commissioner of Education, having been presented to the audience by the President, spoke as follows :

GEN. JOHN EATON'S ADDRESS.

This occasion is a striking illustration of the characteristics of American freedom and civilization. How often, in other forms of government, imperial or monarchical, only members of the royal or aristocratic families are expected to make benefactions for the welfare of the people. Tyndall, even, has expressed a fear that

America would come short in the race of scientific research because of lack of royal patronage.

An intelligent European traveling among us was so struck with the great endowments of which he learned, and the magnificent buildings erected by private persons for educational purposes, that he gathered the best information and illustrations of some of the most conspicuous instances, and arranged them for the benefit of his friends in his store in the old city of Prague, that those seeing them might not wait for royalty, but go themselves and do likewise.

Mr. Rose was a man of the people; he gained his wealth by those methods of honest toil, by that self-denying, persistent application which it is the peculiar distinction of our free institutions to warmly encourage and generously reward. Gaining wealth, he did not coin his soul into money. He preserved his humanity; he was touched by the condition of his fellows. Visiting among strangers in New York City an institution for ruptured and crippled children, he felt their needs, and gave in all for their benefit one hundred thousand dollars. He won his way by toil. His penetration saw the relation of thought to action, of science to labor, of culture to human welfare. He may not have been able to state all the postulates that unfold the effect of education upon handicraft, but he so far apprehended their meaning that he gave funds for this institute of technology, that the honest life efforts of the young who come here may not be burdened and crippled and circumscribed by ignorance. He would offer them here opportunities to gain a power more subtle and effective than that of Aladdin, with which to master difficulties and make nature contribute to their progress, usefulness, comfort and pleasure.

Those intrusted with the execution of his purpose have sought to adopt the wisest means to find out the right way. They have made haste slowly. The problems upon whose solution his great purpose depends for success are not all solved. The two great worlds of capital and labor, so often in danger of arraying themselves in conflict, are bringing all the forces at command for their solution. These considerate officers have sought to take advantage of what has been done. They have selected for President one well known for his capacity, alike for broad and precise scholarship and successful administration, who has brought a similar institution from its first planting to a high degree of merited success, and before putting his hand to the work here has taken

time to visit and study again the conditions of educational progress, general and special, in its great centres and most instructive aspects in Great Britain and on the continent of Europe.

The moment and the conditions are auspicious. Why are they so favorable? By what steps have we reached this stage of educational progress? What is their significance? Each must give his own full answer. I can only allude in the briefest way to a few of the points specially notable in the great march of educational events.

It should never be forgotten that education has been indebted to religion for one of its chief motives, and in much of human history for its main direction. Wherever we turn to religion, true or false, to China, India, Egypt, Judea, or Rome, the priesthood appears as the learned class. How effectively has the religious impulse here and there promoted intellectual activity and growth! We may differ ever so broadly with Mohammedanism, and yet cannot fail to acknowledge the contributions of Mohammedans to chemistry, to mathematics, and the intellectual activity of large portions of the race for considerable periods of time. Among religious devotees in the Dark Ages, when religion had well nigh perished from the earth, the priests kept the lamp of learning burning in their religious seclusion. Near the church and cathedral sprang up the school. Charlemagne brought the aid of the state to the church, and gave a great impulse to education; a subordinate ruler issued a decree for free education in his domain. Later, the agitation of Luther's period aroused inquiry among the common people. He brought to bear all religious motives, and out of them taught the duty of the magistrate to establish schools as well as to build bridges and organize armies.

The religious notion of the value and equality of every man's soul led the New England fathers to enact, by special authority, that "every child must be taught so much of letters that he may read the word of God, and thus know the way of life, and understand the capital laws that he may avoid crime against society."

Frederick the Great, perceiving the situation in Prussia that had resulted from the Reformation, said, in substance: "I can increase the power of my realm, overtaxed by the wars in which I have been involved, by increasing the capacity of every citizen by education." He saw how he had made armies powerful by training officers, and by applying the same principle to education

greatly aided progress in the instruction of the children by establishing normal schools for the training of teachers.

Thus in different parts of the civilized world education has become general. It will be noted, however, that strong and effective as the religious motive may have been in any case, that education has never become universal until undertaken by the civil authorities. In some instances the church has been reluctant to learn this great lesson of history; but by degrees the principle by which the education of all children is guaranteed by the state—while the state also charters, protects, and gives the largest liberty to all private and denominational efforts—has been accepted in all the commonwealths of our union, and become a settled conviction and practice of the great body of our people. All the civilized nations of Europe are struggling over it. For the enforcement of this principle, religion, not as the authority over the state, but as teaching the Christian and moral precepts of the citizens of the state, contributes its enormous quota of arguments. These the statesman reinforces with all the considerations derived from the dependence of the state and the citizen upon universal intelligence and virtue, and one by one the great interests of capital, of Briareus-handed industry, unite their voices in emphatic approval. This great principle established, and education proceeding upon its work of universal instruction for the general purposes of the citizen and of civil administration, supplemented by the free and vigorous efforts for education under the direction of the church for the general good of all and the special benefit of each, general questions of method, that have never been entirely ignored, begin to come to the front with commanding interest.

The precepts of religion and conduct required little illustration to the eye, and the methods of imparting them readily became abstract in their appeals to the reason and conscience. Mathematics could proceed by the same processes, and entered slight protest, but when chemistry and physics and natural science began to demand attention, other processes and appliances were required—laboratories, cabinets, museums, articles and processes that could be manipulated and could appeal to the eye. This has been one of the elements entering into the conflicts that now and then have arisen between science and ecclesiasticism. John Amos Comenius, the noted Moravian bishop and educational reformer, declared even before the landing of the pilgrims, "Ten years are given to the study of the Latin tongue, and after all the result is

disappointing." Erasmus, Vives, Luther, Sturm, Frisch, Sanctius, Domavius, have all complained of this. Boyhood is distracted for years with precepts of grammar infinitely prolix, perplexing and obscure, and for the most part useless. Boys are stuffed with vocabularies without associating words with things, or indeed with one another syntactically.

The scientific method, it is now admitted, has made valuable contributions to the manner of teaching the classics and philosophy. While this much has been proceeding in the improvement in methods, certain other changes have been introduced in education for the better adaptation of culture to the necessities of mankind.

As I have intimated, among certain ancient peoples, and in the more recent developments of culture, the learned class was at once preacher, lawyer, doctor; but now we begin to see in education the application of that principle which marks all human progress.

So far education had been argued and its doctrines maintained on general grounds; a man's general improvement was urged, and his preparation for specialties left to his own direction and the development of his own experience after leaving school. Even in this general culture there were great variations; in one nation, or period, attention to the physical predominating; in another, care for the intellectual culture; in another, special enforcement of moral and religious precepts and practices.

Any one will see the results if he will compare a citizen of Rome with one of Athens, or either of these with one of the faithful in Jerusalem.

The thoughtful leaders of mankind have generally agreed with Socrates, first a man, then a specialist, whether a shoemaker, or statesman, or musician.

The condition of concentrated populations, the demands of certain arts and guilds centuries since, led thoughtful men to inquire whether there was not in education a power, when it had given general culture, to add also something specific and useful to the training of the hand. The device which has met this demand in the main was apprenticeship; but the changed condition of society rendering it undesirable or impossible for the craftsman to take the lad in his charge, a demand has been made upon the school to solve the new problems thus presented. Scholarly educators observed that the several learned professions had come out of general culture by degrees. The practices and observations in

the direction of law, and those in the direction of medicine, began to be recorded and studied separately from theology and the subjects of general culture. At first even in these learned professions the principle of apprenticeship was applied. The pupil doctor, and lawyer and preacher studied and began to practice with his preceptor. After a time, and that within a recent date, as you are well aware, it was found that classes could be brought together and several, or a large number instructed as well as a single student, and then came the professional schools of medicine, law and theology. The other vocations, taking this with other hints, began to observe, record, print facts and doctrines of their theory and practice, and as an outcome we have had for a considerable number of years in Europe an increasing array of schools of technics and schools for artisans.

The processes of general education applied to man are like the processes of multiplication applied to numbers. The progress of material improvements, of inventions, the increase of man's power over the forces of nature, the multiplication of possibilities of human enjoyment, have been found to keep pace with this general culture.

Even the power to read and write indicates an increase of twenty-five per cent. in the producing power of the man engaged in the rudest manual labor; an advance of culture, an increased producing power of fifty per cent., and so the ratio goes on; and when you come into the computation of its results as affecting invention, the devising of new machines and methods, the economic direction of forces, the protection of health and life, no money value can be placed upon these benefits. But taking society as it is, and as it was represented in the census of 1870, we are directed by eminent experts to the fact that only about half of the population is self-supporting. How then can the burdens of the self-supporting class be lessened by increasing the number of self-supporting, becomes a question not alone of pedagogics and morals and statesmanship, but a question vital to every individual.

Under the influence of these considerations, thought and effort are necessarily turned to the processes of instruction with the inquiry, cannot the processes of education be modified on the side of industry so as to increase the producing power of labor and thus multiply the possibilities of human comfort?

The affirmative answer is coming up in greater and greater measure from all the civilized nations of the earth.

England finds in a world's exhibition that her goods are losing their place in the markets of the world because of the lack of skilled workmen. Her statesmen, under the lead of the noble Prince Albert, foreseeing the greater evil, establish Kensington, with its industrial museum, its schools of drawing, of art, and of manifold industries; and this great forward but special movement soon points out more clearly the need of more effective general education, and we have the great elementary education act of 1870, which not a few English statesmen believed prevented a portending social revolution.

In the United States a large portion of our people have been engaged in the struggles of pioneer life. The church and the school house have been conspicuous side by side in their settlements. The schoolmaster has been abroad in the common school. The increase of books and newspapers has been marvelous. The discharge of the duty of citizenship and of the manifold voluntary associations promotive of social and individual welfare in addition to the efforts for self-support, have had a marked and healthful educating influence.

The chances for wealth have been rewarded with remarkable success, and have been sought by the citizens of every civilized nation. Among these newcomers to our shores are many who have received the training of schools of technology and of the arts and trades. These scientists and experts have contributed enormously to the development of our interests and the advance of American scholarship and literature.

Some years since, in connection with an effort to overthrow the high school in one of our largest manufacturing cities, an inquiry revealed the fact that the foreman in each of the large manufacturing establishments had enjoyed the advantage of skilled training in a foreign land.

The conditions which have led to the establishment of special schools in other lands are becoming apparent in our own.

Educators and benefactors have united in their establishment and efficient conduct. The old colleges have admitted scientific departments. Harvard, the Lawrence Scientific School; Yale, the Sheffield; Dartmouth, the Chandler. The natural sciences have been given larger space in the curriculum of all colleges. General culture has been brought into closer relations with the struggles of life; but more has been demanded.

In 1862 the Congress of the United States made a grant of lands from the public domain for the establishment of colleges of agriculture and the mechanic arts, and these institutions have been accordingly established in all the states, except one, and are now doing good work. Often and often they have been declared failures by those who did not know the facts.

It should be observed that there were no institutions established to fit young persons to enter these colleges of agriculture and mechanic arts. All fitting schools aimed to prepare their students for classical courses. Moreover, our farmers had not in sufficient numbers come to appreciate the application of scientific information and training to their great industry, and were not ready to compensate sufficiently the graduates of these institutions to warrant them in devoting their lives to the tilling of the soil. Our educated youth cannot be blamed for turning their efforts in the direction of the greatest success. But changes have come rapidly. In addition to these institutions, in which more attention is expected to be given to technology, science and industry, many others have been established and sustained by private endowments, and these have been adding their graduates, specially qualified in the various departments of engineering and mechanic arts. Already a larger number trained in these state and private institutions are demanded by those who wish to apply science to agriculture. They are called for as foremen in the manifold manufacturing establishments; they are directing the enormous capital invested in mining; they are surveying our rivers and harbors, our coasts, our undeveloped lands, and marking out the ways for our great railroad enterprises. It is gratifying to know that the demand is greater than the supply. The Polytechnic school has its own work to do in this community and this state. We have passed the time of frontier life, rude, vigorous and poor. We have a great population, a various industry, enormous natural resources to use wisely and provide for shrewdly. The loneliness, the privations, the dangers of early times, are gone with the free land, the forest, the deer and the panther; the frontiers of our speech and our civilization are now at the Rio Grande and the Athabasca. The work of four generations has made the Ohio valley and the Lake region more populous, more accessible, more rich than all the thirteen colonies that fringed the Atlantic coast a century ago. Our wants, our tastes, our objects have changed as much as the circumstances of our life. We wish for comfort as well as shelter,

for tasteful as much as warm apparel, for various as well as sufficient food, for mental as much as bodily nutriment. The defective, dependent and delinquent classes of our population are better fed, lodged, clothed and instructed than the pioneers of the old time. The soil must produce more and better food, without losing fertility; the earth must yield its coal, iron, lead and copper for the arts of peace and the uses of war. The waters must bear craft of which our forefathers never dreamed, and must be curbed so that the fields and homes of our people shall not be submerged; the electric fluid must carry, not only the verbal, but the oral messages of our intercourse. The waste, the ignorance, the carelessness of the past are doomed. The problem for the new age is to perfect every appliance for man's progress over land and wave, his comfort as well as his necessities, his enjoyment as well as his life.

The common advance in economy, precision and importance which improvements in machine construction have made manifest in that branch of industry, must be sought for in other branches of work and life. Our trades, our farm work, our buildings, our vehicles, our vessels, must be equally developed and perfected; and our tastes, our minds, our bodies and our souls must not be neglected. The graces of life, the amenities of manner, the beauties of art and nature must be cultivated as sedulously as corn, and bred more carefully than sheep and horses. Not men only are required for this work. Already women have had a share in the increase of opportunities. The normal schools, especially, have opened to them new careers as successful teachers, and biological, chemical and scientific laboratories are offering to them the same opportunities for excellence as to men.

The Rose Polytechnic Institute to-day takes its place in this array of great schools of science, technology and industry. It has wrapped up in its plans untold blessings for the community in which it is established. It is one of a trio of somewhat similar institutions, Purdue University and the University of Illinois, which together with itself may be said to stand at the angles of a limited triangle whose lines may draw them into a proximity calculated to awaken the sensitiveness of some minds, but each of these institutions in its local approaches can only create a healthy emulation. Each and all are under national demands to do their utmost, not alone to learning, to science, to the arts and trades, and citizenship, but to general education. I have alluded to the effect of establishing the Kensington museum and technical and indus-

trial schools upon elementary education in England. Our educators are recognizing a similar necessity in this country. Teachers are needed who understand more of arts and trades. The intelligent public mind in America is struggling with this problem of how to adapt the common school education to the changing needs of industry and society. The Secretary of the Interior and Congress are revolutionizing the methods of educating the Indian. They want teachers who know how to teach the ideas, the habits, the practices of the men and women, the self-supporting members of civilized life. Our cities, struggling to provide special schools for the large number unable to follow the general course of training in the common schools, are asking for teachers qualified to teach arts and trades. The North and the South, the East and the West, are joining hands to raise up the children of the race recently slaves. They can see in the present light how to give them books by State and voluntary and national aid; but they find no adequate response when they call for teachers to instruct the women in those industries of which they have so generally a monopoly in those States—household economy, purchase of articles of household use, chemistry of the kitchen, the duties of nursing children and the sick, laundry work and the preparing and cooking of food or the corresponding economies and skill for men as farmers and mechanics. I say, therefore, God speed this and all similar institutions. May they multiply and increase in efficiency so as to do their part with thoroughness alike to all special instruction and all contributions to the general welfare and general education. If I ought to add another remark, I wish I could convey to you some idea of the activity manifest to one in the Bureau of Education at Washington, that national clearing house of educational information upon the instruction to be imparted in these institutions. Germany, with all its previous attempts in this direction, has just had a special commission traveling to gain information on this subject. There is enormous activity in France; even Spain and Russia are bringing institutions of this class to the very forefront of excellence. England has had a learned commission thoroughly investigating the subject upon the Continent; her colonies in North America and in distant seas have been making the same inquiry.

The many demands at Washington have prompted the Senate to call for a special report on industrial education in the United States. The Bureau of Education seeking according to the measure

of its means to answer these demands, has printed the preliminary report of the English commission and has issued a small circular on instruction in the minor arts, for which a single mail brought requests for over six thousand copies. Another extended report is in progress on drawing and instruction in art.

The persons among us who are making this subject a special study are as yet unnumbered. Every philanthropic and patriotic impulse of our natures prompts us as Americans to desire that the problems committed to this and all other institutions of learning in our land may be solved without the necessity of blows and violence.

You may remember the story that Prof. Roscoe told of a visit to a technological school in the French city of Rouen, where he was shown a museum of natural objects. The Englishman saw among the articles a German helmet, and asked, "Do you call that a natural object?" "No," said the French director, "but it plays a very important part in our teaching. When our young men seem lax and indifferent I put this helmet on the table before them and say, 'Gentlemen, look at that helmet; you know how it came here; you know that the wearers of those helmets stripped France of her fairest provinces from the Alps to the British channel, and humiliated us in our city of Rouen. You know also that they were able to do these things because they were more intelligent than we Frenchmen were. Do you wish them to do it again?' Nothing quickens the industry of my students as that helmet does."

Friends of Rose Institute, may you never need to remember any victory in your own territory over yourselves—whether in arts or in arms, gained by others, because of your ignorance. May your children ever find the highest stimulus to application, not in disgrace, but in the wisdom and success of their fathers.

At the conclusion of Gen. Eaton's address, a recess of half an hour was taken, and lunch was served to invited guests and others in one of the large halls of the second story. During the interval the museum, the library, the lofty clock-tower, and many of the rooms of the building, were visited by the audience.

The exercises being resumed, Dr. Lemuel Moss, President of the State University, was called upon by President Collett for an address, and responded briefly. Dr. Moss not having been able, owing to the pressure of his engagements, to comply with the request of the Board that he should furnish a report of his remarks, it is impossible to present them as delivered. They were a notable episode of the ceremonies, and, in the characteristically

eloquent manner of the distinguished speaker, recognized the new institution as an important addition to the educational forces of the state, extended the heartiest and most cordial welcome to Dr. Thompson, President-elect of the Faculty, and paid a glowing tribute to the far-sighted and practical benevolence of the generous founder.

The President then introduced Dr. Emerson E. White, President of Purdue University, who said :

PRESIDENT WHITE'S ADDRESS.

Disappointments meet us on the mountain tops as well as in the valleys. When I entered this hall this morning I anticipated nothing less than being a serene and delighted listener to these auspicious exercises; but, in a few minutes, my serenity was disturbed by the approach of one of the officers of the day, who in a sentence gave me to understand that I would be called upon to speak. A glance at the face of my disturber satisfied me that a refusal would be useless, and so I surrendered with as much grace as possible to the unwelcome information.

While I should much have enjoyed the privilege of being a silent listener, the occasion makes speech easy, since it affords me an opportunity to welcome to Indiana my friend, Dr. Charles O. Thompson, who this day assumes the direction of one of the most important educational enterprises in the West. He comes here to try no new experiment, but to organize and direct an institution all the elements of whose success are familiar to him—he comes an organizer, who sees the end from the beginning. I join most heartily with President Moss in welcoming so distinguished a representative of higher technical education to this noble commonwealth, whose vast industrial resources are waiting for the touch of technical science and skill to turn them into fabulous wealth. I have watched the work of Dr. Thompson for years, and his acceptance of the presidency of this important technical institution, is, to my mind, a full assurance of its success. I stand in this presence as the representative of Purdue University, an institution founded by Congress for the benefit of agriculture and the mechanic arts, and I assume no prophetic forecast when I express the belief that there is to be no unpleasant rivalry between the two institutions. The success of Rose Polytechnic Institute will emphasize the practical importance of technical training, and it will thus create a wider appreciation of the special work for which

Purdue University was founded. It is true that Purdue covers a wider field of technical training, but, in this case, whatever strengthens a part will strengthen the whole. The better the technical training here the better the industrial work at Lafayette. Purdue welcomes her worthy co-worker in the field of industrial education, and she extends most hearty congratulations that the opening to-day is so auspicious and so full of promise.

The American people are at last awakening to the importance of technical training, so universally recognized in the older countries of Europe. Seven years ago, when I went to Purdue, there was little demand for agricultural or mechanical education in this state, and, though the present appreciation of such training is far from satisfactory, the change wrought in these seven years is full of encouragement, the most significant evidence of this change being the founding of this great technical school by private munificence.

It is becoming more and more evident that the railroad, the steamship and the telegraph have destroyed our industrial isolation, and that the American artisan must successfully compete with European workmen in skill or retire from the shop and surrender the market. The day of mere muscle in industry has passed and the day of mind, with skill of eye and hand, has dawned. It may be well for a time to put legal barriers between American industry and foreign competition, but in the end we must depend on equal technical knowledge and skill. What our vast resources most need is the touch of science and technical power, and hence the technical school is the prime factor in the problem of American industry. This is the great industrial lesson which the people of this country are beginning to learn—and not a day too soon. Thought in the brain of the workmen has been the source of our marvelous material development. It has been the parent of invention which has already wrought a revolution in nearly all departments of human industry.

Forty years ago the father and his sons, with sickle in hand, filed into the wheat field and handful by handful laid it in sheaves. A thoughtful reaper, with aching back, asked himself the question, "Why can not I give my fingers to my scythe?" The answer was the invention of the old square-cornered cradle, with which the harvest hand could cut two acres of grain with less weariness than he had cut a half acre with a sickle. Another thinking workman, with aching arm, asked himself the question, "What is the use of

so much timber?" and he rounded the corner, inventing the "muly" cradle with which the harvester could cut half an acre of grain more daily and with less weariness than before.

But the sickle long since disappeared from the harvest field, and is now kept only as a relic of other days; the old square-cornered cradle hangs on a dying peach tree with a single finger left; and the "muly" cradle is only kept to pick up lodged places and cut out corners. When the harvest waves its golden welcome to the joyous farmer, out from the stable come fat horses, and attached to wondrous reaper and self-binder, round and round the field they go, leaving the grain in well bound sheaves. Here is progress in farming as the industrial result of thought power. Thought in the brain of labor is the alchemy that is turning every thing it touches into gold.

After Dr. White's remarks, President Collett presented the keys of the Institute to Dr. Charles O. Thompson, President of the Faculty, in the following terms:

Professor Thompson: In selecting a President of the Rose Polytechnic Institute the managers were impressed with the importance and delicacy of the duty devolving upon them. The question as to whether the Institute were to be successful and meet the expectations of its founder, or prove a source of disappointment to its friends, depended largely upon the wisdom of their choice.

The matter was long and carefully considered, and every effort made to secure the fullest information as to the fitness of the persons suggested for the position. Their unanimous choice has fallen upon you, and they deem themselves fortunate in having secured your services, believing that the Institute will be safe in your hands, and its prosperity and usefulness fully assured.

On behalf of the Board of Managers I tender you the keys of the Institute.

On receiving the keys, Dr. Thompson, in a few brief *ex-tempore* sentences, thanked the Board of Managers for their expression of confidence and pledged his best efforts to secure the success of the school. He then proceeded to the delivery of his inaugural address.

DR. THOMPSON'S INAUGURAL ADDRESS.

The Rose Polytechnic Institute is a school of technology. In order to understand the functions of the school it is necessary to take a brief survey of the field of technical training. This phrase describes all those forms of training youth which deal with the application of art or of science to the industrial arts. Those schools in which designing for the patterns of textile fabrics, or for the decoration of wood, iron, pottery, gems, etc., is the principal end, are called art schools, or schools of design, of which the South Kensington system is the most famous example; all those in which the principles of physical science are studied with reference to their application to the solution of practical problems in building, machine construction, and design, or in civil engineering, are called polytechnic or technological schools. There is great confusion just now in the use of terms, technical education being used to describe all that which aims at a directly practical end as opposed to the education given at the college; while that part of it which does not deal with ornament or textile design is sometimes described by the same term. The word technology, which formerly signified the terms used in the sciences, now means the application of the sciences to industrial ends. The term polytechnic, originally used to describe schools of technology, has refused to yield to the more desirable synonym, technological, partly because it is an easier word, and partly because it contains a suggestion of the many-sidedness of the subject which the better word lacks. There is no good word corresponding to polytechnic or technological to apply to the persons who practice the profession indicated, and so these persons are called, now as always, engineers, and the business engineering. A few still cling to the term scientific schools in speaking of these institutions. In the present prevailing confusion of terms the best that can be said is that a polytechnic school teaches technology to engineers. Below the grade of the polytechnic there are multitudes of schools and parts of schools that teach the elements of the mechanic arts—many of them of the greatest interest and importance—and around it are many institutions that devote themselves to industrial art; but I must deny myself the pleasure of discussing any of these, with the important collateral questions of policy that they present, and proceed at once to the school we have in hand—the polytechnic. We shall find that all schools of technology, under whatever

names, or with whatever special aims, present a common system of instruction complete in itself, with strenuous requisitions, a logical curriculum and a sharply defined end. In treating of technology, I am happily absolved from the duty of pointing out its importance; that is settled by the establishment of this school and others like it by the men who endowed them. They were men whose sagacity was too strong to be mistaken.

Technology is essentially a new idea; it is certainly no older in its present aspects than the discovery of the law of the conservation of energy—the great idea of the present century. No discovery since that of gravitation has been so stimulating or so powerful. Its influence is incalculable. It is seen in the multiplication of labor-saving machinery for every form of work, the great array of useful inventions, the expansion of the system of land and ocean highways, and especially in the immense increase of the means for acquiring knowledge. This demand for economy of force and material has brought about great changes in the industrial arts; the apprentice system has disappeared; the necessities of life being made by machinery, manual trades are no longer needed for that end, and skilled handicraft is a rare accomplishment. There is and there will always be a demand for skilled labor in the arts of building-construction, in pattern-making and similar forms of wood-work, in die-sinking and kindred arts that deal with the metals, and especially in assembling and finishing the parts of structures as they are delivered from machines; but this is a small demand compared with what existed when shoes, clothes, furniture and tools were made by hand. The mechanic of the future will be a machinist. To such an extent is this replacement of handicraft by machinery true that we have shoemakers who cannot make a shoe, chairmakers who cannot make a chair, and generally artisans ignorant of the whole of any art. Mr. Batchelder, of North Brookfield, Mass., the largest shoe manufacturer in Worcester county, said that out of his six hundred men not more than ten could make a shoe. I once examined a very interesting picture of some pieces of iron that had been done by boys in an experimental forge-shop; the work seemed to be well done and creditable to the workmen; but out of some seventy pieces not more than ten would ever be made by hand at all in actual manufacturing.

Another result of the economy of force is that attention is concentrated now more upon the principles of phenomena than

upon the phenomena themselves. Formerly the only hope of finding a better or cheaper way of doing things lay in the chance discoveries of ingenious men—men looked at things from the outside in; now it is seen that nothing is so fruitful and that nothing so advances human interests as a principle—men look at things more from the inside out. For, nearly all mechanical ways of doing things were once regarded as out of the ordinary course of human affairs and to be relegated, if not to the domain of the supernatural, at least to that of the superhuman. The feeling towards scientific investigation as a means to practical ends partook of the same quality that infested men's views of disease; if typhoid fever prevailed in a given district the people did not look to their drains and wells, but flocked to church and appointed a day of fasting. What were regarded as the pardonable vagaries of Daniel Treadwell, Rumford Professor in Harvard University, turn out now to be the inventions upon which single-track railroads, the machinery for spinning cordage-yarn, the Armstrong, Blakely and Krupp cannon depend. I will venture, however, the assertion that no person in this audience ever heard before of these great inventions as Treadwell's; they came too soon for the world to know them as works of genius, yet they are the first fruits of the new era in which great problems are solved, not by happy inventions of geniuses real or affected, but by the sober and steady application by laborious scholars of established principles of physics.

Time would fail me to enumerate the influential inventions that have sprung from a similar origin. Who has not heard of the Siemens' Furnace, the Bessemer Converter, dynamite, compressed air and the uses of electricity? And it must also be remarked that each of these inventions demands corresponding machinery of novel design; for another feature of the new era is the necessity of reconstructing old machinery in more economical forms and the constant call for new machinery to meet new demands. When a new invention is made nowadays, machinery for it is as important as the invention itself. Perhaps the most striking illustration of the change in common things which has been brought about by technology is the rail on which railway traffic is conducted; formerly it was an iron edge rail, supported by chains and having more iron in the base than the head; clumsy as this rail was, it was claimed to be the only form in which the only available metal could be used for the purpose; now the rail is made of steel, with

well defined tread, web and base, the principal weight of metal in the head, where it is most needed, and every line subjected to the finest physical tests. To those who know how much of the best knowledge we have of physics and chemistry has been put, and is still put into a railroad rail, it seems one of the most interesting of all modern manufactures. It is not wide of the mark to characterize the past age as one of invention, the present as one of engineering. The study and mastery of the principles of physical science, the ability to express those principles in drawing and descriptions and to apply them to the solution of practical problems through machinery and handicraft are the essential qualities of an engineer. So that a polytechnic school, by whatever name called, technological, technical or engineering, teaches technology to engineers, i. e., it teaches the principles of physical science and their application to the industrial arts.

Engineering is the term that includes all the arts of production and construction which arise from the physical sciences. Its object is to bend the forces of nature to the service of man.

The names applied to the different branches of engineering are not always appropriate, but in general, a civil engineer constructs public works, such as highways, railroads, water works, sewers, etc.; a mechanical engineer deals with machinery, from the original design of each part, through the machine shop and into the structure and to the operation of the structure, i. e., the machine; the chemical engineer applies chemistry to the manifold products that result from the play of chemism. Then there are numerous fields which the term covers: as hydraulic, steam, gas, electrical engineering. In each and all, the engineer is distinct from the artisan or craftsman by exactly the amount of his knowledge of the scientific principles which underlie the practice of his profession and his resulting ability to apply those principles to the ready and complete solution of real problems as they arise.

For example: Mr. Batterson had occasion to cut a block of marble so as to produce a warped surface, for which his workmen had no patterns; the men had great skill in stone cutting, but could not cut that stone. A graduate of a school of technology happened to be employed in the city schools as teacher of drawing; hearing of the case at the marble yard, he tendered his services, applied the familiar principles of stereotomy, made patterns, and the men at once executed the work. Last November the Italian government made comparative tests of the power of different

armor-plates to resist the shot of heavy ordnance; the plates that stood the test were made by Schneider, at the shops of the French technological school at Le Creusot.

The bridge over the Vistula river, at Warschau, was built by a graduate of Carlsruhe; that over the Volga, by English engineers; but the latest, largest and most costly bridge in Russia—over the Neva—was built by graduates of the Imperial Technological school of St. Petersburg, and every piece of iron that entered into it was tested in the laboratories of that school.

A few years ago it became suddenly desirable and important to pump out the central shaft of the Hoosac Tunnel; a suction pump was plainly inadmissible; the craftsmen had nothing to suggest; a young engineer built a small raft on the surface of the water in the shaft, lowered on to it a steam pump, set his boiler at the shaft mouth, had himself lowered to the raft, and alone in the darkness worked his pump twenty-six hours without accident and with great efficiency; men then tendered their services in abundance, and the problem was soon solved.

But the air is full of modern instances of the triumphs of engineering skill in overcoming great natural obstacles; the use of the inclined plane in the zig-zag roads over which horses trot in safety and at ease from Alpine heights to the valleys below; the application of compressed air to the two purposes of sinking caissons and driving machines at a great distance from the source of power, the use of the friction clutch, the air-brake, and a thousand other examples of the application of the familiar principles of science to the solution of mechanical problems. In each case, however, it will be noticed that one man may understand physics thoroughly, as thousands of men have understood the subject, and another man may understand the construction of machinery, but not one of the triumphs of engineering above mentioned be achieved. The theoretical knowledge of physics and the practical command of machinery must come together; if this happy conjunction occur in one and the same man, the best results follow. Then the same affluent good comes forth in the domain of mechanics that abounded in the middle ages, where the artist and artisan were one; when Peter Vischer and Quentin Matsys worked at blacksmithing, and Michael Angelo cut stone, and Benvenuto Cellini hammered silver and gold, each touching the iron, or the stone, or the silver, with a beauty and value that all the ages since have only enhanced.

Here some one will surely interpose the fact that E. B. Bigelow, the inventor of the modern carpet loom and one of the greatest of American inventors, could neither make one of his own machines nor the working drawings for it. His head was an amazing tangle of mechanical contrivances, but the draftsman and mechanic were indispensable to the successful evolution of them. This of course was a temperamental matter with him. We cannot change the fact that many inventors cannot express their own ideas; nor am I going to claim that any amount of technical training or of any other kind of training is likely to aid a so-called mechanical genius very much. Indeed, Mr. Bigelow never admitted to me at least, that a course in technology would have aided him; the nearest approach to such a concession was the remark, at the close of a busy forenoon spent in studying the Worcester school: "Well, I'll go home and consider how all this would have affected me had I begun here as a boy." I do not think he would have begun there or in any other school, for he was a genius in the best sense. A genius is a law to himself, the processes by which the mass of men must gain knowledge are strange and useless to him; generally he is a poor adviser in educational questions. He can never be educated in any sense in which the word is understood by ordinary men. Still, by a knowledge of the principles of mechanism and the methods of expressing and applying those principles, the ordinary inventor would secure to his use the benefit of his own inventions which somebody else so often appropriates, and would save the Patent Office much of its costly and superfluous rubbish.

No graduate of any school is at that time an engineer. The qualities of good judgment and efficient reason grow only in the atmosphere of experience. Hence no diploma can be regarded as meaning anything more than that the possessor has passed successfully the examinations that are set at any particular school. Graduates should begin at the bottom of their profession and their school training will tell best and most effectively in the rate of their advancement. They will advance more rapidly than others along the lines which are determined by their natural aptitudes.

The Almighty makes superintendents and leaders of men—no school can do this. But the training required for a superintendent must be that of his subordinates. All the best experience of the world sanctions this rule. A superintendent who has not had the training of the shop is as useless as Achilles without his weapons—he may seem and assume to direct and to lead, but he does not;

on the other hand, the man who attempts to lead without natural leadership, however wise, is as useless as the weapons without Achilles.

The question how men shall best be trained for engineering was asked long ago before any practical result ensued.

The Marquis of Worcester, imprisoned in the Tower of London, 1645, working industriously upon his steam and water engines, cast eyes upon a lot which he could see from his window and instructed his agent to buy it, intending, he said, as soon as he was set at liberty to erect a school wherein boys might learn something of the principles of the mechanic arts. But he was never allowed the opportunity to carry out his idea.

There is an interesting letter from President Leonard Hoar, of Cambridge, to Robert Boyle, in which the good man, after acknowledging some favors from Boyle, discloses to him some darling projects of his own about the improvement of the course at the University and says: "I would have a large, well sheltered garden and orchard for students addicted to planting; an ergasterium for mechanic fancies, and a laboratory chemical for those philosophers that by their senses would cultivate their understanding; for the students to spend their times of recreation at them; for reading or notions are but husky provender." Boyle did not encourage the President, and his project slumbered for two centuries, but was at last substantially realized in the Lawrence Scientific School.

The first independent polytechnic school was the Ecole Polytechnique in Paris, founded in 1794. The Ecole Centrale followed, and during the first quarter of this century similar schools were established all over France, Switzerland and Germany.

In this country, the best appointed and on the whole, the most worthy of study as far as methods go is the Military Academy at West Point; then we have the Columbia School of Mines at New York, the Sheffield at New Haven, the Rensselaer at Troy, the Institute of Technology at Boston, the Stevens Institute at Hoboken and many others. These are examples of pure and independent schools of Technology, each with a special end of its own, but possessing all the generic features of the class. They all arose from the demand for engineers in the arts of peace and of war. To this list must be added the state colleges of agriculture and the mechanic arts, several of which have made provision for effective teaching in engineering. The polytechnic school has always offered to the qualified average boy a good education based on

drawing, the mathematics, the living languages and the physical sciences, tending to qualify him for immediate entrance upon the duties of an engineer. The course of study in a polytechnic school is determined by long experience and in all countries is substantially the same. It includes

Mathematics—Beginning with algebra and geometry, and proceeding through trigonometry, analytical and descriptive geometry, the calculus, theoretical and applied mechanics.

Physics—From the elements to the solution of problems, sometimes with laboratory practice.

Chemistry—With laboratory practice.

Language—The elements of German and French, (English replacing one of these in European schools) and the mother-tongue.

Drawing—Beginning with free hand and including perspective, orthographic and isometric projection, shades and shadows.

Geology and mineralogy as far as time permits. The other natural history sciences are necessarily omitted, except in special cases. In all these schools the instruction is given with a strong practical bearing, and generally the students learn the manipulation of the instruments used in surveying, and the more important of those used in physical researches.

It is necessary to remark at this point that technological schools do not include schools of design. There is a great interest in European countries and in the United States at the present time in what is called industrial art, meaning the study of form, color and ornament to renders tructures and manufactured goods intrinsically more beautiful, and to increase their value by this means. A department of drawing and design has a place in a school of technology, but engineering does not naturally include the work of a school of design.

But polytechnic schools as they were did not meet all the wants of the new era. Practical men detected a lack in engineers who had been trained without actual contact with a machine shop—there was a surplus of theoretical engineers and a dearth of practically efficient ones.

The principle of the division of labor resulted in making it next to impossible for a boy to find a place in any machine shop to learn the trade. The owner did not want him because it could not be in any way conducive to his business interests to employ a person ignorant of his business; and if he employed him at all he kept him on a single sort of piece-work, from motives

of self-interest. Trades Unions conspired to keep out apprentices from shops, and so it came to pass that a boy could not get a good working knowledge of machine-shop practice except by stealth.

This demand for mechanical engineers with work-shop training, and the practical impossibility of finding a place for a boy in any good machine shop, led to the establishment of a polytechnic school in which a manufacturing machine shop is a prominent and thoroughly administered feature. This is the school known as the Worcester Free Institute.

This institution was organized under the influence of a belief that, after all that has been done in technology, there is still need of a system of training boys, broader and brighter than "learning a trade," and more simple and direct than the so-called "liberal education;" that while the boys should be thoroughly trained in all the essentials of a polytechnic course, they should also find a work-shop open where they could get all the essentials of a trade; so that upon graduating they should have sufficient knowledge of machinery and handicraft to enable them to earn a living while pushing their way up to the highest positions for which nature and their training had qualified them. It was held that not the least important of their qualifications for high positions is a good experience of the lower positions.

"It is the undoubting opinion of the managers of the Institute, and of all who have watched its operation, that the connection of academic culture and the practical application of science is advantageous to both, in a school where these objects are started together and carried on with harmony and equal prominence. The academy inspires its intelligence into the work of the shop, and the shop with eyes open to the improvements of productive industries prevents the monastic dreams and shortness of vision that sometimes paralyze the profound learning of the college."*

This school was opened in 1868, with the following fundamental ideas:

1. That all mechanical engineers will find their account, in future, in going through a work-shop training.

2. This work-shop instruction may precede, accompany or follow the intellectual training, but for many reasons it preferably accompanies it.

3. The work-shop instruction is best given in a genuine manufacturing machine shop where work is done that is to be sold

*Worcester Catalogue. P. 7.

in open market and in unprotected competition with the products of other shops.

4. That in a course of three and a half years, working 800 hours the first half year and 500 hours a year thereafter, a boy beginning without any knowledge of mechanics can acquire skill enough to offer himself at graduation as a journeyman and will be found on trial not inferior to those who have spent the entire time of three and a half years in a regular machine shop.

5. That the work-shop practice must be a part of every week's work in the institution; that it shall be momentarily supervised by skilful men, and that the student must not expect or receive any pecuniary advantage from it.

6. That the question who shall be a superintendent or foreman or engineer engaged in designing or drafting machinery cannot be settled in any school—that being a question to be determined only by actual trial; because the discipline of the judgment by actual practice into which personal responsibility enters is vitally essential to a valid claim to the post of superintendent. Hence, it will follow that, while all receive the preliminary training requisite for engineering, many will not attain to it, but these will find a full reward for all their time and labor in superior intelligence as workmen—in being masters and not servants of the machines which they make or run.

7. A seventh principle was announced when the first class graduated, and has been inculcated into all their successors, viz: that the value of the education they have received will show itself in the rate of their advancement and will be easily detected by their employers, and that they should not be so much concerned, in seeking places, about great wages or high positions as about the chances ahead for advancement; indeed there might be cases in which they could well afford to work a while for a bare subsistence, such would be the value of their experience.

These principles have now been tested under as favorable conditions as could be desired for fourteen years, and this experience all goes to confirm them. No valid objection has been urged and no adverse criticism worth a moment's attention has been heard. The expense attending the proper development of this plan is the only difficulty in the way of its general adoption; but, within the brief period of its existence, the Worcester School has seen two great institutions founded on its plan, the Miller School in Virginia and the Rose School at Terre Haute.

Now since the principles just recited are to be the regulating force in the organization of this school, some discussion of their grounds is in place.

No argument is needed to prove that an engineer should have practical acquaintance with handicraft and with the machine shop in general. The great demand for men who have this qualification and the surplus of unemployed theoretical engineers, otherwise able and competent men who lack it shows that the point is well taken. The experience of the older countries sustains this view. It is found in Austria, so the Baron Von Eybesfeld (Minister of Public Instruction) told me, that there is a great excess of graduates of the polytechnic over the demand, and that he is now engaged in organizing a new kind of school in which workshop instruction shall form part of the course, so that the country may have some men for foremen and superintendents of works who are thoroughly versed in the practical details of machine-shop work. In carrying out this new policy, the latest phase, it will be noticed of technology, the great Gewerbe Museum has been organized and put in charge of Dr. Exner, a strikingly competent and efficient man. He has started two totally distinct sorts of schools: the first is substantially a half-time school, in which boys from the higher common schools work half the day and study the other half, receiving instruction according to the polytechnic plan as far as the time permits; the course being two years, these boys do not receive as much instruction as the polytechnikers, but they have the immense advantage of practical power in the shop, which secures them a living and adds to their value. Every stroke of work in the shops is done with reference to the sale of the articles, and no fact was mentioned oftener, or with more evident satisfaction by Dr. Exner in proof of the solid excellence of the school than that they sold in the first year a thousand gulden worth of their work. It is intended to multiply these schools so that they shall provide a great variety of mechanical practice (the two now in operation being devoted wholly to wood working) and to extend the course to four years. When this has been done there will be in Vienna two schools in which all the principles of the Worcester Institute will be adopted and applied.

The second line along which the Austrians are moving is in cultivating what are known as cottage industries; this movement is so interesting that I shall venture to say something about it, though it is not immediately germane to our purpose. There is

a marked tendency in Austria to concentrate population in large cities. The population of Vienna has grown from 800,000 to 1,200,000 within ten or twelve years and other cities show a great increase; this has occurred without a corresponding increase in the total population; the inference is that the growth of the cities is depopulating the villages—an unmistakable and alarming fact. Inquiry into the causes of this movement has brought out the fact that the peasants of these villages have lost the market for their baskets and other wares because their Swiss and French neighbors, who have had abundant schools of industry, have devised new and more attractive forms for the same wares. The peasants of Austria were unable to compete because, through their ignorance of design, they were confined to the old and unsalable forms, and with the fatuous haste so often seen, crowd the cities in the vain hope of bettering their lot. Dr. Exner, under the general direction of the wise and acute Minister of Public Instruction, has started schools for basket-weaving—by far the most important of these household industries. Half of the day is devoted to learning new and better ways of basket-weaving, and half to drawing and modeling in clay; the result being that the pupils learn how to do the things that are now in demand and are clothed with power to design whatever forms the future may suggest. Anybody may attend these schools who chooses to come to Vienna; for there only can a museum of examples be gathered sufficiently ample to enable the minister to multiply the schools so as to provide for other industries as well as basket-weaving. The hope is that the more intelligent young peasants will attend these schools and carry back to their villages the new ideas; this being done, a check will be put upon the tendency of people to leave the villages, because they can again be prosperous and happy where they are.

Upon the question whether workshop instruction should precede, accompany or follow the school training opinions differ, and a full discussion of the subject is impossible within the limits of this address. This subject occupied the attention of the American Institute of mining engineers through two prolonged and intensely active sessions in 1876, and the results are embodied in a valuable pamphlet which presents the views of the ablest engineers in the country. I will briefly summarize the facts and motives which seem to leave us practically no alternative but to incorporate the shop practice with the school-work. Boys fitting for a polytechnic school cannot leave the preparatory school younger than

sixteen; if they are to get their shop-training before the polytechnic, they must spend three years at it and at the end of the time they will be rather too old to get the best advantage of the school, and miss the all important opportunity of applying their theoretical knowledge as they go along.

If, on the other hand, boys defer the shop till after graduating, they will find many excuses for slighting it or for not doing it at all. At the age of twenty, with a good knowledge of drafting and well disciplined faculties, American boys would be far more likely to turn into draftsmen or to take their chances in business than to submit to the dull routine of elementary shop-practice. Theoretically there is much to be said in favor of this plan, for it brings to the work-shop the trained powers of the school and makes the practice continuous. It is the plan of the Russians, in the Imperial Institute of Technology at St. Petersburg, certainly one of the best technological schools in the world, where the students, after a four years course in pure technology with the usual holidays and vacations, return on the first day of September and work in the machine shops till the first day of the following September, ten hours a day without vacations, and the results are very satisfactory. But the Russians can carry out such a system because the government controls the positions to which the students aspire and without which they must starve, and makes the fifth year of practice compulsory. Very few who have had much experience in teaching American boys believe that such a plan could be successfully adopted here.

There are many solid, positive reasons in favor of incorporating the shop-practice with the intellectual discipline. The period of a boy's life between sixteen and twenty-one is the period of sharp acquisition; ideas taken then remain in a special sense a part of the mental furniture forever. Probably no one, whose course of education is uninterrupted, acquires as much as between the ages mentioned, or retains what he acquires as long. It is an interesting fact that the enthusiasm which an American boy cherishes for his college, an English boy feels for his school, where the training he most values was received. The American hurrahs for Yale or Harvard—the English for Eton or Rugby. The same would be true here were all our boys fitted for college at a few large schools and fitted as well. This being true, shop practice has an advantage it would otherwise lose in coming into this period.

Again, a man whose matured and furnished mind has laid hold of the strong problems of theoretical mathematics in school, and who finds himself on the threshold of manhood does not bend himself with just the same ease as an ungraduate to the elements of machine-shop practice. There is some advantage, too, in beginning shop-life in periods of five hours semi-weekly over ten hours a day; for less time proportionally is wasted. And finally, a great economy of the precious time of the students is secured because shop-work serves the double purpose of practice and of exercise.

Why the school workshop should not be a shop in a complete sense and not a mechanical laboratory or some other device for escaping the hard but necessary discipline of a shop, has not yet been stated. There is a difficulty in meeting the first cost and inevitable annual deficit, but if any other valid objection has been made to the plan it has escaped my attention. It offers every advantage of every other form of school-shop, with immense additions.

The advantages of a shop in which actual construction is made to aid in instruction are numerous; a few only can be mentioned. These boys are all hoping to be engineers, at least they may expect to become skilled workmen or draughtsmen. In any event the more the faculty of judgment is cultivated, and the more the boys realize the nature and extent of the difficulties that actual practice presents, of which the best theoretical knowledge gives no hint, the nearer they are to attaining the end they seek. We have seen that no graduate of a school is an engineer, but is in the best way to become one. Why not advance him as far as possible? If now the student's comprehension of the principles of engineering is clear and his weekly practice enables him to see those principles in action under conditions as like as possible to those which he will meet in real life, his entrance upon the life of an engineer will be an expansion of his school-life, and not an abrupt transition from it to a new mode of life. The more his work is subjected to the inexorable tests of business, and the more he feels in the use of his materials just the same responsibility that rests upon an actual workman, the better he is. He must make the things that are to be used and not those contrived to suit the peculiarities of his temperament, the exigencies of his situation or the mere purpose of instruction. There is nothing that a student needs to make in

a school workshop from which he cannot gain something if he puts the article into its final serviceable form.

Applying the stern test of serviceableness is the only way to know whether the things that have been made were worth the making or not, and is the only way to correct any tendency to visionary structure that is so apt to infect a school workshop, and to prevent that sublimation of common sense which is apt to ensue when responsibility for the correct use of costly materials is removed.

There is no merit or charm in work, considered merely as work; to work to produce something that some one else wants and cannot make for himself and is able to pay for is the stimulus of industry. All work in school-shops or any other will ultimately obey this law or else it will evaporate into exercise or sport.

Workshops into which the principle of construction does not enter are liable to exalt the importance of the purely literary aspect of mechanical knowledge. It is possible to know the five hundred and seven mechanical movements, to know the best cutting angles of saws, files and edge tools and not be a mechanic or be in the way of becoming one. This kind of knowledge is useful and attractive and desirable when it is not offered as a substitute for the dexterity that can be obtained only by the use of the tools. It will not do to regard our ancestors, the skilled mechanics, as fools. There is still but one way to learn to file and that is to file. The most expert filer I ever saw could not write his name. I do not think he could have filed any better had this simple accomplishment been added to his merits; he would have been a better and a happier and more useful man with more knowledge, but he did that one thing as well as it could be done at that time.

But this thought instantly suggests another of the greatest importance, viz: handicraft occupies a constantly narrowing place in the mechanic arts; machinery a constantly widening one. Every year adds to the number of trades from which the machinist has driven the craftsman. It is clear then that no training of boys for the life of mechanics is complete which does not make them familiar with machinery and machine-construction.

There is one demand sometimes made upon the school-shop which is unjust, namely, that it should pay its way. How can it pay its way when so large a part of its force is spent in teaching boys? If so many machine shops in this country, fitted up and managed with especial reference to money-making fail in business,

or only make the ends meet by the most painful efforts, how can a shop one-half of whose effective force is spent in teaching boys, who cannot for the first half of their time produce anything salable, hope to pay its way? Teaching in school-shops costs as teaching elsewhere costs.

Many difficulties have been met and overcome, and many more which wore a threatening aspect ceased to be difficulties at all when the time came to deal with them. It is idle to spend time, therefore, in enumerating and discussing these difficulties. Those that remain are of trifling magnitude. It is better and more interesting to turn attention for a moment to another solution of this problem of technological education in the school at Moscow, in Russia, which was opened almost exactly at the same time as the Worcester school, and is now administered on the same general plan. I visited the school last October and will record a few observations upon it. The first room, into which I was shown by the superintendent of the shops, half the size of this chapel, was devoted to conferences with purchasers of machinery and would-be purchasers, who needed the aid of an engineer to design and draught machinery for special purposes; all the machinery thus designed is made in the school-shops. This room was filled with large drawing tables, on which lay working-drawings of machinery in various stages. The second room I saw was the engine room, where a twenty-horse engine was doing its best to drive the machinery of the shops, and later I saw a duplicate of this engine, every part of which had been cast and finished in the school-shops. The third rooms were the machine-shops, smithy and foundry, where a hundred workmen are employed in the double duty of manufacturing, and instructing the students how to manufacture; mingled with the workmen on that day were about sixty students. The fourth room was a store house in which was exhibited 60,000 roubles worth (\$30,000) of machinery and machine tools, being the result of one year's work, and just brought back from the annual exhibition of the Industries of Central Russia. An equal amount made during the previous year has been sold. The fifth rooms were a series of smaller apartments in which, for convenience, the students begin their practice. The method of teaching them is this: each year about eighty boys are received at an average age of seventeen and a half years; the course of study is six years, of thirty-two weeks in each year; for the first, second and third years, the boys all work in the shops

fourteen hours a week, or 448 hours annually; for the fourth, fifth and sixth years, ten and a half hours a week, or 336 hours annually, so that they work an aggregate of 1344 hours in the first three years and 1008 the second three; the rest of their time is occupied with the ordinary curriculum of a polytechnic school. The practice of the first three years, or rather more than half of the whole is spent in preparing for that of the second three; i. e. for the first half they do not attempt any manufacturing, and for the second half do not do anything else.* In these rooms the boys were filing, forging, sawing, turning, etc., each as fast and well as he could, all the boys in any one room being responsible to the foreman of that room, whose duty it is to provide work for each boy and decide upon its quality. Each boy is pushed as far as possible in the time allotted to each room regardless of his mates. The work done in these rooms is mainly thrown away, though some is saved for models.

But the boys are just as much in need of direction and efficient skill when they emerge from the elementary shops as they were before, and it never occurs to the faculty that one of these boys is fit for any shop but their own until his course is completed, any more than an ordinary college faculty regard sophomores as ready to study theology. The boys in the elementary shops have free access to the manufacturing shops, see where every piece they are making fits and how it is used—they do everything in a manufacturing atmosphere, and every boy who passes the requisite examinations, with very few exceptions, passes into the manufacturing shops. The Moscow school-shop is a great manufacturing establishment and, if the manufacturing element were removed, the school would be either revolutionized or extinguished. The elementary shops are a convenient, and for that school, serviceable and economical device for doing what all school work-shops must do, separating unsalable work from salable, and keeping apprentices at work by themselves though in full view of and in full co-operation with the manufacturing shops till they have skill enough to begin to do salable work. My conviction is, however, that the results are not what might be expected; for the work done by these boys at the end of their first half year course, or after 1344 hours practice, does not compare favorably in excellence with that done by the boys at Worcester after their first half year, or 800 hours,

* The Superintendent said that if one of the boys in the preparatory room made anything salable they did not hesitate to sell it.

and candor compels me also to say that the work of the graduates at Moscow is at least not at all superior to that of the Worcester men.* The graduates of this school and of that at St. Petersburg compete for the same prizes and all obtain good positions in manufacturing establishments.

Some statistics will show the thoroughness of the discipline of the school and the importance attached to it by the government. The government appropriates 250,000 roubles, or \$125,000, annually to this school (and the same to St. Petersburg). The number of Professors is fifteen, of Lectors ten, all others three. The tuition is 150 roubles, or \$75.00, a year. The floor space at Moscow is not less than 400,000 square feet—that of Worcester is 50,000.

A set of plans of the building will soon be found in our library.

It adds great force to Russian examples and precedents to know why we find their polytechnic schools of such rare and unsurpassed excellence.

The popular impression of Russia does her great injustice. The educated Russians are a highly educated and accomplished people. Part of this intelligence is due to the intermixture of the German population, which began soon after the death of Catharine and has continued to the present time. Now, when the Russians began, about fifty years ago, to attend to the development of their internal resources in a scientific manner, they started in the most sensible way, by sending commissioners to study the systems of technological education of Western Europe. These men winnowed Europe for ideas. These ideas they carried to Russia and expanded into schools which surpass in completeness of equipment and affluence of resources all others in Europe, with the possible exception of the Ecole Polytechnique, in Paris. They had the money to give German ideas of education an expansion and development of which the Germans, in their poverty, never dreamed. Russia is the lee shore upon which the choicest educational pebbles may be gathered. In studying Russia one sees all European technological education epitomized.

And since the notice of these inauguration exercises was printed I have news that the Imperial Institute of St. Petersburg has stretched her hand across the wide waters to give us a welcome into the fraternity. Notice has come that a box of examples of

*The work done by the graduate-mechanics of St. Petersburg is especially interesting because it is evidence of the advantage of well-disciplined faculties in acquiring skill in handicraft.

the work done there and a collection of drawings has been shipped as a present from one of the oldest to this, the youngest of the polytechnic schools.

But I must hasten to complete this exposition of principles. The fourth fundamental at Worcester is that in a course of three and one-half years a boy, by working 800 hours the first half year and 500 hours a year thereafter, can gain as much dexterity and be as fit to offer his services as a journeyman as he would be had he worked three and one-half years steadily in a modern machine-shop. The experience of two hundred graduates of the Worcester school, and the opinions of the manufacturers in whose shops they have found employment, establish the fact. Some of the reasons for this somewhat paradoxical result are that in an ordinary machine shop a boy must spend his time in his employer's interest and not in his own, and only a small portion of that time is devoted to teaching him manipulation; in the school-shop the time is wholly used in teaching. Again, the student-apprentice is under daily training in school and comes to his work with alert faculties and acquisitive powers constantly growing stronger. This is especially true with reference to his weekly practice in free drawing, a study which tends to develop and train the sense of form and proportion, the very training that a mechanic most needs. And, again, the work of the student is done under the eye and with the ready assistance of a skilled workman whose duty it is to teach him, by precept and example, all he can learn. Meantime, while he has been getting his manual dexterity, our student-mechanic has obtained a good education. The remaining principles require no further explanation.

It will now be asked what may the graduates of this school be expected to do. To this I reply by reciting what the graduates of the Worcester school have done: Occupations of graduates—

Partners in business firms	23
* Superintendents	16
Chief Engineers	3
Division Engineers	5
Assistant Engineers	16
Civil Engineers	20
Draughtsmen	49
* Mechanical Engineers	10
* Machinists	13

* Many of these are "Master Mechanics."

Foremen	8
Teachers	17
Chemists	12
Advanced Students	4
Designers	5
Others, mostly engaged in manufactures	45
	246
Deceased	9
Total	255

More than ninety-five per cent. of the graduates are engaged in occupations for which their training at the Institute specially prepared them.

In the Rose school the following modifications of the Worcester plan will be attempted:

1. The course of study will be four years instead of three and a half.

2. The practice will be concentrated in the first year and diminished in the fourth, so as to allow time for more instruction in machine-design.

3. While the same subjects will be taught, perhaps more attention will be given to the humanities.

4. A different view will be taken here of the profession of civil engineering from the one usually held. The young men who propose to be civil engineers will spend a part of their practice time in the machine-shop.

Civil engineering cannot easily be separated from mechanical, because the most important business of a civil engineer nowadays is not surveying and mapping but bridge and building-construction, the setting of water-wheels and other engines, and such like undertakings which involve a knowledge of mechanics; so that two or three of the best so-called civil engineers in the country have given it as their judgment that a course in mechanics including workshop instruction, is the best way to prepare for the practice of civil engineering.

But on the other hand, the building of new highways and railroads still goes on and calls for a certain number of young men who are expert in the use of the transit and level (especially in railroad problems) who know how to draw and who understand mensuration; hence, training for this sort of employment cannot be neglected in a polytechnic school. It would conduce to clearness to call such work Topographical engineering.

An added consideration of some weight in favor of retaining a distinct department of Topographical engineering is that many of the young men who frequent technological schools have no taste or aptitude for mechanical work, and some have not the requisite physical vigor for it, whose fitness for success in field-work or in mapping is unquestionable. But it will be clearly advantageous to all to have some workshop practice. No changes will be made except such as reason and a large experience show to be desirable and advantageous to the student.

But a healthy child wants food. An adequate beginning must be sustained by continual contributions in order to good progress. We want the sympathy and patient consideration of the community. We want books, apparatus and models constantly in excess of the resources of our funds. The example of our founder is worthy of attention and imitation.

The machine-shop is ready; a reference library will soon be on the shelves; a cabinet of minerals is on hand; ample models are ready for the proper equipment of rooms for drawing and design; the bricks for a new building for a chemical laboratory are now lying in the yard; apparatus for chemistry, physics and field work is in the building or provided for; commodious recitation and lecture rooms are ready when wanted.

I hope also, in course of time, to collect models and examples of the best mechanical devices, and also of leading manufactures. These collections of models play a very important part in European technological schools, and for obvious reasons. Indeed, the outlay in some cases is enormous and would be insupportable did not manufacturers find their account in placing here examples of their best work. At Chemnitz I saw two good examples of this class: one a perfect working model of the Hartman locomotive, which cost \$3,000, and the other a large working model of the Merkel stationary engine, worth \$250—each presented by the manufacturer.

In order to any effective use of these resources two things are vitally requisite: good teaching before the students enter the Institute and good teaching afterward. It is on the whole, a mistake to suppose that fitting for the polytechnic is essentially different from fitting for any other form of manly labor in this world which depends upon a sound, instructed brain. Technically, boys will be examined for the present in English grammar, geography, United States history, arithmetic, and algebra as far as quadratic

equations; but these are the essentials of any success at all in the polytechnic; the more a boy knows before he comes the broader and deeper his success will be. The polytechnic is a professional school and must concentrate itself upon its own special work; but the broader the base on which it builds, the more massive the structure that can be reared. Whether the polytechnic course shall rear an obelisk or a pyramid depends on the preparation of its students.

Men are born as ignorant as they ever were and the same steps from ignorance to the elements of all knowledge must be taken by every one. This work usually occupies the first fifteen or sixteen years of every human life.

It is very desirable that every boy who presents himself for admission here should have at least a full high school course; if he cannot get that, let him make the closest possible approach to it. Youth once passed, the opportunity for acquiring the rudiments of knowledge is usually gone forever. And eye hath not seen nor ear heard a sadder thing than the lament of a man who, amid the emergencies of life, suddenly confronts his need of some simple knowledge which he might have got for the asking in his youth.

The greatest solicitude will be ever cherished here about the quality of the teaching. It is not intended that students shall find more assiduous or competent teaching in the various branches of the course than will be constantly found in this institute.

But there is one peril and annoyance to which the new polytechnic is subject: handicraft in school never having been used before except for reformatory purposes, the impression gets abroad that the institution must lower its intellectual standing to raise the handicraft. I do not know an institution in this country except West Point where boys achieve as much good work or are better prepared intellectually for effective service as engineers than they are at Worcester. We propose to give the same training here.

If what has now been said seems to have a too exclusive bearing upon the study and practice of mechanics it is because this is the leading department, and presents the only novel and difficult features of our enterprise; but there will be departments of civil engineering, physics, chemistry, and design organized on the same general plan; the studies will be the same in all departments—the practice different according to the purpose for which it is intended. These departments naturally group themselves; for chemistry, physics, and drawing must be taught to mechanics, and the addi-

tional expense required to give practice in each of these departments to those who prefer it to mechanical practice is very small. The outlay required for civil engineering practice is justified by the demand.

Later in our enterprise a department of Mining Engineering may be organized; and in the department of physics special attention will be given to electrical engineering. All this will come about in due time. It will be observed however that only one kind of practice can be profitably taken by any student, during the course. Full particulars in regard to all these matters will be seasonably given.

If this account of the origin and method of the technological school be correct, it is obvious that it is no longer an experiment, that it fills a gap, that it is a natural, inevitable, every way desirable and welcome concomitant of modern civilization. It does for the industrial arts what the colleges have so well done for the learned professions by fitting men in a carefully planned course of study for the intelligent discharge of their duties.

The polytechnic seeks to work as an ally of the old classical college, and hopes that her old friend may find something to her advantage in studying the economy of force which prevails in the methods and results of the new comer. The polytechnic does not sustain any organic relation to the college such as the academy has on the one hand and the professional school on the other; yet in a deeper sense it sustains a very important relation to it. Whatever tends to increase or foster the desire for knowledge tends at once to foster all institutions whose object is to promote knowledge. Every new institution tends to increase the interest in the old—provided the old are worthy. Of course, I do not mean by “new institutions” repetitions of old types, such as the multiplication of small colleges, for this is generally an evil rather than a good (except in new States), but I mean new institutions, like polytechnic schools, that strike their roots into new soils and make what was once a desert blossom as the rose.

Technical schools have not affected the colleges unfavorably in the matter of attendance; for in spite of the crowds that have flocked to their doors, the classes in the colleges have steadily increased. More new colleges have been founded during the period of the rise of polytechnic schools in this country than in any similar period before; the old colleges have received munificent increase of their resources and have more than held their own in

the matter of attendance, and all the students attending the state universities in the course of Liberal Arts may be reckoned as a solid addition to the ranks of the college.

For obvious reasons the polytechnic school flourishes best when separate and distinct from the college; but the more it flourishes the more it will directly benefit the college by providing for the instruction of the youth who demand the so-called "practical courses" and thus leave the college free to pursue her own legitimate work. Towards all forms of knowledge technology is hospitable, and towards all who know, engineers are affectionate. The study of science in a teachable and reverent spirit does not beget intolerance or bigotry. Science inculcates hatred of pretense, and is intolerant of dogmatism; but mindful of the counsel of her greatest disciple, she utters the solemn words of Bacon:

"This also we humbly beg that human beings may not prejudice such as are divine, neither that from the unlocking of the gates of sense, and the kindling of a greater light, anything of incredulity or intellectual night may arise in our mind toward Divine mysteries."

The day has forever passed when the old idea that the study of Latin, Greek and the humanities is the only education. The definition of an educated man will bear still more expansion, but it has broadened rapidly, during the last quarter century. *"The vulgar argument that a study of the classics is necessary to make a gentleman is beneath contempt. Honor and gentleness are not a dye or a lacquer, but warp and woof. It is true that a certain social consideration attaches to persons who are supposed to know Latin and Greek, whether they are gentlemen or not;" but society is rapidly adapting itself to the new era in which men and women are to be taken for what they are and not what they are said to be.

It is an unique and interesting fact that most of the polytechnic schools have been founded and endowed by private benefactors. The colleges, seminaries and academies have depended at times upon legislative fostering. Hardly a session of a State legislature passed prior to 1873 without considering some bill in aid of an educational institution. But the strong point about polytechnic schools is that the enormous expense of founding and administering them has been provided in most cases by individual citizens who knew their value. The Ecole Centrale in Paris, next to the

*President Eliot.

Polytechnique the best in France, was the joint product of the brains of Dumas, Pictet and Ollivier and the pocket of their friend Lavallee, who paid all the expense of starting and running the school for five years, and at the end of that time presented it to the government. In this country Lawrence at Cambridge, Van Rensselaer at Troy, Sheffield at New Haven, Stevens at Hoboken, Boynton, Washburn and Salisbury at Worcester, Rose at Terre Haute, Case at Cleveland and many others have said in tones which many generations will hear what they think of the value and importance of technical education, and have made the State the recipient and not the nurse of their bounty.

In the city of Glasgow, nothing impresses a traveler more amid all its teeming industries than two monuments, one of great height and majesty to John Knox, the other a simple tablet in the wall of the cathedral to the memory of George Bailey who founded unsectarian schools and libraries for the operative classes.

The city of Terre Haute will cherish none of her treasures longer than the memory of her princely benefactor; but her choicest heritage is the inalienable right to put upon his monument with a change of name the inscription which can be read at the grave of Copernicus in Warschau:

TO CHAUNCEY ROSE, OUR FELLOW CITIZEN.

President Thompson's inaugural being concluded, President Collett called upon Dr. Barnabas C. Hobbs, a former member of the Board of Managers, and now a trustee of the State Normal School, who thus responded:

DR. HOBBS'S REMARKS.

About eight years ago I became personally acquainted with Chauncey Rose by accepting an invitation to make his house my home, while attending a State Educational Association. During a breakfast conversation my bachelor host stated that his friends had been advising him to get a wife, and turning to me said, jocosely, "What do you think about it?" I answered that "Men sometimes had an unwritten history, and until I knew his I did not think it well to give him any advice." He thoughtfully remarked, "You are right, sir, I have an unwritten history."

I saw from his manner he had sympathies the world knew not of, and that he was not an enemy to woman. Sometime after this, on the occasion of another visit, he told me how anxious he was to

use the means at his disposal in a way that would do the most good. He had been a successful business man, and everything he had undertaken seemed to have been a success. He asked me what I thought he had best do. I told him I thought no investment would pay better than one paying the expenses of deserving young women in the Normal School. Women had a hard time in finding profitable employments, and teaching was exactly suited to their condition in life. He was pleased with the suggestion and authorized me to select one dozen, then fourteen, then he increased the number to twenty. William A. Jones, President of the State Normal School, was my aid. We chose, chiefly, such as promised well but were not able to complete the course without aid.

In time I suggested to him the desirability of securing a building for a boarding house, which with furnishing would not cost more than \$20,000, and giving an endowment of \$100,000, in aid of deserving young ladies who could not pay their way. He acceded to the proposition on condition that the State should pay one-half the cost of the building, and authorized the Board of Trustees to say that much to the Governor and State Legislature in their next report. It turned out that no official notice was taken of this proposition, unless it was a paragraph in the Governor's message. He became disgusted with their lack of appreciation and his mind underwent a change.

When I next saw him he told me he had lost faith in public officers and politicians. Changes in parties imperiled finances and he did not want to leave his money in the control of State authorities or trustees. He preferred private incorporations who are empowered with self-perpetuity. He had been thinking much about business men who are good workmen, but can not prepare their estimates, drawings and specifications and have to be running to lawyers and architects. If he could do something for them he would like to do so. I informed him what he wanted was a polytechnic school. I had visited several in the East, and especially one at Worcester, Mass., which gave a full and complete scientific training to boys, practically fitting them for business men; and if he desired me I would write to Prof. Thompson for some reports which would give him a correct idea of the purpose and working of such an institution. After examination of these his mind fully settled on the endowment of a polytechnic school and on the erection of a building. His will was then made, specifying his bequest, which he read to me. I think very likely

Josephus Collett, the presiding officer of the Board, whose head is ever full of practical ideas, had also a leading part in formulating his thoughts and purposes.

A Board of Trustees was chosen, a Constitution and By-Laws drawn up, an organization completed and a seal approved and ordered to be made, Chauncey Rose being President of the Board. An occurrence created no little amusement when it was discovered that nearly all the Board were bachelors. We must not, however, reflect on them. I well remember finding a very worthy old gentleman in England, who had never been married, in a good comfortable home with a hired housekeeper. I deprecated his lot in a conversation with an estimable lady. "Oh," she said, "I presume he is not to blame for it." Our fortunes are not all alike in life. The poet Whittier tells us of the sweet little girl who hated to go above him in the spelling class at school, over whose beautiful form the grass has been growing for more than forty years. No, do not reflect upon bachelors. How do we know but that more of them are preparing to make further endowment bequests to polytechnic schools.

At the suggestion of Chauncey Rose, while I was in New England, I was requested to inquire of Prof. Thompson for some talented student who had passed under his training and who had skill and fitness for such a place. When that result was almost achieved there was a suspension of operations by the death of Chauncey Rose.

When an advance movement was resumed, I was agreeably surprised to find that, like Miles Standish's courtship, the Board instead of taking the man President Thompson had recommended took the President himself, and it now so turns out that we have for the Rose Polytechnic Institute the leading educator in technical science in America to give it rank among the best in the world.

I desire before I close to say that we ought not to stop in this enterprise where we are. The girls need polytechnic schools as well as the boys. They need to know how to cook scientifically. There is scientific taste and method in good ventilation, neatness. Health and science are co-ordinates of a system. Every girl should know how to cut and make her own dresses. Indeed, I question whether a young lady should be allowed to marry if she could not stand a successful examination on these subjects.

You may have seen a notice of some French ladies who had lately been inspecting schools in America, and had been at Vassar

and inquired of the young ladies what attention they gave to cooking, and housekeeping, and cutting and making. "None," was their answer, "We have domestics to do such things." The visitors laughed outright at the absurdity of young housewives superintending cooking, housekeeping and seamstresses when they are unacquainted with the work they are doing.

Let us hope and look for the day when our girls will be able wisely and intelligently to attend to the kitchen and household interests and to cut and make their own dresses. We need professional scientific schools for girls as well as for the boys for the completeness of an educational system.

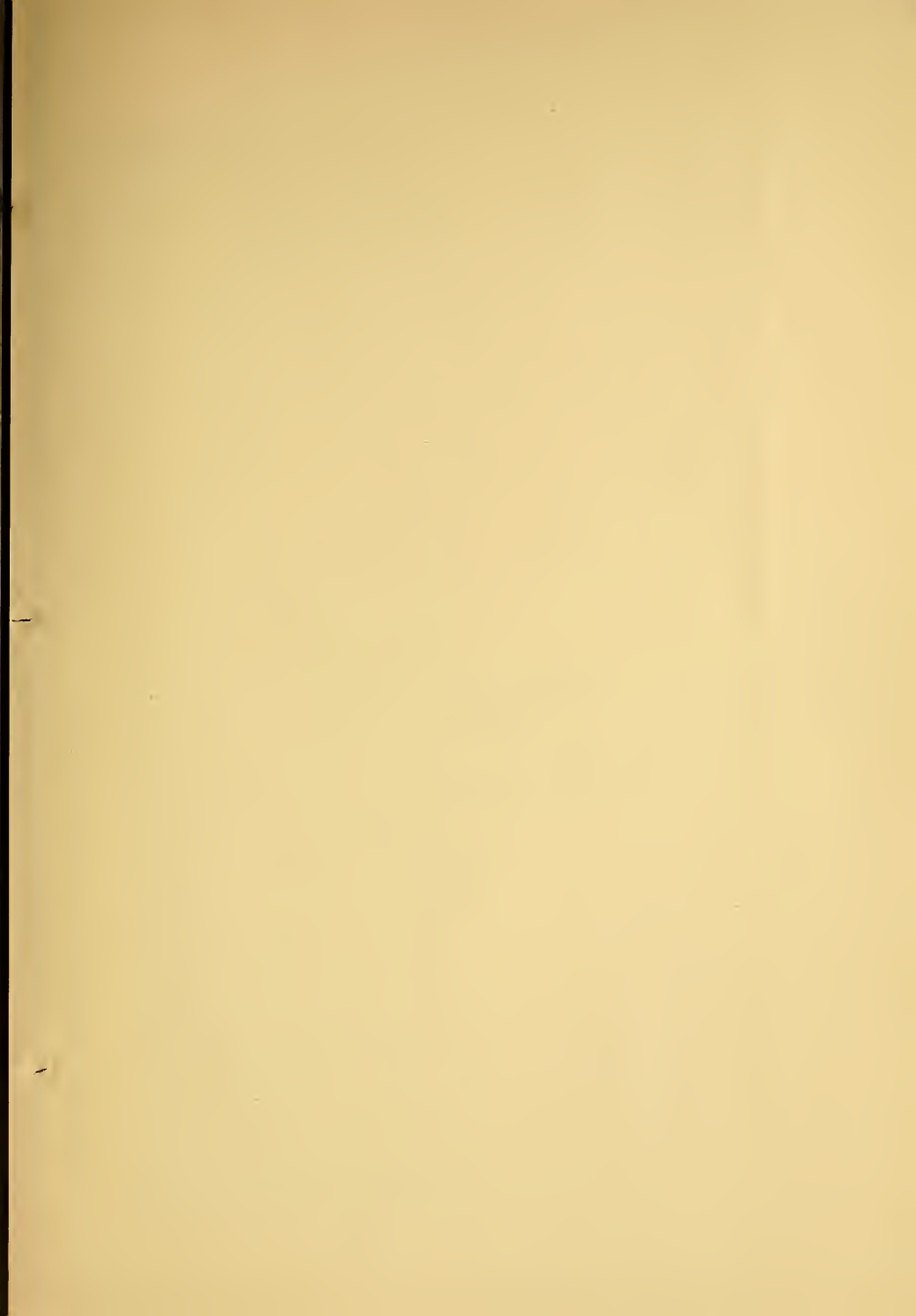
After music by the orchestra, Rev. Mr. Croft pronounced the benediction and the audience dispersed.

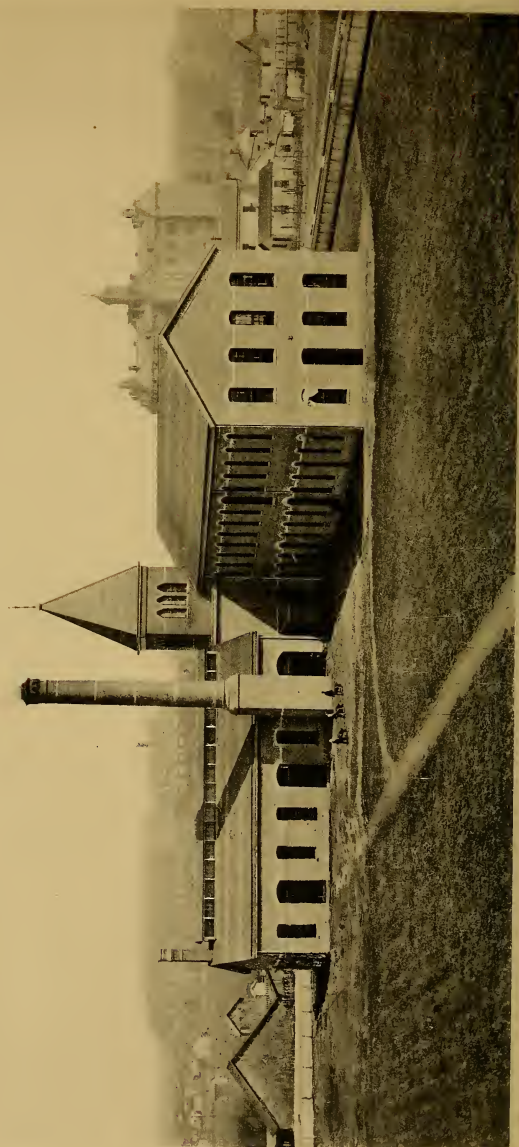
On the 23d of March, the managers were called to deplore the death of their friend and associate, Gen. Charles Cruft. Identified with the Institute from its inception, General Cruft had been one of its most efficient and enthusiastic officers, and had given to its organization and development the benefit of his untiring efforts, his accomplished and comprehensive scholarship and his sound practical judgment. He had been especially active as a member of the building committee and as chairman of the committee on the library; in both of which positions, and indeed in every other relation of his managership, he had contributed services of inestimable value.

March 24th, Mr. William A. Jones resigned his membership in the Board on account of his contemplated removal from the State. The resignation was accepted. Mr. Jones' long experience as a teacher and organizer of schools, and his wide reputation as a distinguished President of the State Normal School, had rendered his connection with the Board remarkably helpful. His fellow members accepted his resignation and parted from him and his pregnant suggestions with particular regret.

At a meeting held on the 31st of March, Hon. R. W. Thompson and Mr. William C. Ball, were elected to fill the vacancies occasioned by the resignation of President Jones and the death of General Cruft.







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FIRST

ANNUAL CATALOGUE

OF THE

ROSE POLYTECHNIC INSTITUTE

WITH

PLAN OF INSTRUCTION.



1883.

BOARD OF MANAGERS.

JOSEPHUS COLLETT, ESQ., President.

CHARLES R. PEDDLE, M. E., Vice-President.

SAMUEL S. EARLY, A. M., Secretary,

DEMAS DEMING, ESQ., Treasurer.

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HON. WILLIAM MACK.

ROBERT S. COX, ESQ.

PRESTON HUSSEY, ESQ.

HON. RICHARD W. THOMPSON. LL.D.

WILLIAM C. BALL, A. M.

FACULTY OF INSTRUCTION.

CHARLES O. THOMPSON, A. M., PH. D.,
Late Principal of the Free Institute of Industrial Science, Worcester, Mass.,
President.

CHARLES A. COLTON, E. M.,
Late Assistant to the Professor of Mineralogy in the School of Mines,
Columbia College, New York, Professor of Chemistry.

EDWARD BARNES, B. S.,
Graduate Student of Johns Hopkins University, Professor of the Higher
Mathematics.

CLARENCE A. WALDO, A. M.
Late Assistant Professor of Mathematics, in Wesleyan University, Middle-
town, Conn., Professor of Elementary Mathematics and Librarian.

JAMES A. WICKERSHAM, A. M.,
Late Instructor in Kansas University, Professor of Languages.

.....
†Professor of Physics and Theoretical Mechanics.

.....
†Professor of Engineering.

EDWARD S. COBB, B. S.,
Late Assistant Superintendent of the American Paper Bag Company, Bos-
ton, Superintendent of Machine Shop.

WILLIAM L. AMES, B. S.
Late Student at Cincinnati School of Design, Professor of Drawing.

†To be appointed.

THE ROSE POLYTECHNIC INSTITUTE.

This Technical School, founded by the late Chauncey Rose, of Terre Haute, Indiana, is now open for the instruction of young men in technology.

In accordance with the directions of the founder, the Institute offers a good education based on the mathematics, physical sciences, living languages and drawing, and familiarity with some form of applied science or handicraft. The course of study is so planned that every student spends a fixed portion of his time in learning the elements of the business or profession that he designs to pursue after graduating; this part of his work is called practice.

Recitations, lectures, laboratory work and drawing are of uniform kind and amount for all students; exercises in practice are widely different, depending upon the department selected by the student. The general course of study does not differ essentially from that pursued in other Polytechnic Schools. The practice is offered in the following departments: Mechanics, Civil Engineering, Chemistry, Physics, Drawing and Design. The choice of a department is made by each student soon after entering, under the advice of the faculty. A department of Mining Engineering will be organized as soon as possible and duly announced.

APPARATUS FOR INSTRUCTION.

Recitation-rooms, lecture-rooms, laboratories and drawing-rooms are ready, ample supplies of models, plates, and laboratory equipments having been purchased. Field instruments for the use of Civil Engineers have also been provided.

A cabinet of minerals containing 5,000 specimens carefully arranged to facilitate the study of geology and mineralogy, is displayed in a room convenient for use.

A library of 5,000 volumes, selected with especial reference to the wants of students of technology, but not destitute of works of standard literature, is on the shelves and will be increased as occasion demands.

In the shop is an assemblage of rooms in which iron and wood-working tools and machinery, arranged with reference to instruction by means of construction, are provided for the use of students. The wood room, boiler and engine rooms are in order; the iron room and forge shop will be in order before September 1, 1883, as all the requisite tools are now under contract; so that students in mechanics will enjoy the advantage of practicing in a large, well-lighted, manufacturing machine shop, which is equipped with the best modern tools and machinery. All products of the shop will be made for sale, and the labor of the students will be supplemented by that of skilled journeymen, who will finish the work under the inspection and for the instruction of pupils; the latter will thus be surrounded by the influences of actual business and under the incentive of emulation with practiced handicraft. In the equipment of the machine shop the sum of nearly \$30,000 has been expended.

Plans for a new building to be devoted to the uses of a chemical laboratory have been submitted to the trustees and the work will be begun early in the autumn. Ample provision has been made for the study of physics according to the most approved modern ideas.

COURSE OF STUDY.

The course of study occupies four years, and the work is arranged as follows:

(The figures indicate hours per week.)

FRESHMAN CLASS:—Free Drawing, 6; Mathematics, 7; Practice, 25; Private Study, 14. Total, 52.

SOPHOMORE CLASS:—Free Drawing, 2; Mechanical Drawing, 6; Mathematics, 6; Language 4; Chemistry and Physics, 4; Practice, 10; Private Study, 20. Total, 52.

JUNIOR CLASS:—Mechanical Drawing 6; Mathematics and Theoretical Mechanics, 4; Language 4; Chemistry and Physics, 4; Practice, 10; Private Study, 24. Total, 52.

SENIOR CLASS:—Mathematics, 5; Language and Ethics, 5; Physics, 3; Chemistry, 1; Engineering, 3; Practice, 10; Private Study, 25. Total, 52.

In this course the term *Mathematics* includes algebra, geometry, trigonometry, analytical and descriptive geometry, the calculus, theoretical and applied mechanics; *Physics*, heat, light and electricity, each abundantly illustrated; *Chemistry*, the study of the

elements, the use of the blow-pipe and the outlines of wet analysis; *Drawing*, free hand work, perspective, orthographic and isometric projection, shades and shadows, and the construction of working drawings of machinery; *Language*, the German language, the English language and the elements of French.

In addition to the general studies now enumerated, lectures are given in geology. Exercises in determinative mineralogy are included in the chemical instruction.

Only such changes will be made in this course as experience may show to be desirable. Students pass from class to class only by passing the term examinations.

The practice of the students in chemistry and physics will be in the laboratories, of the civil engineers in the field and drawing-room, of the designers in the drawing-room, and of the mechanics in the work-shop; but, in order to give the civil engineers some knowledge of tools, their practice will be in the workshops for the first two terms of the Freshman year.

In short, it is the intention of the managers and faculty that nothing shall be lacking to give the students of the Rose Polytechnic facilities not surpassed in this country for acquiring a sound technological training.

ADMISSION.

Candidates for admission to the Freshman class must be at least sixteen years old, present certificates of good standing and pass examination in the following branches, viz: English Grammar, History of the United States, Geography, Arithmetic, and Algebra to Quadratic Equations. The entrance examination will take place on Tuesday, September 18, 1883, at half-past eight o'clock A. M., at the office of the President. At the same time and place, candidates for the Sophomore and Junior classes will be examined and must give evidence of fitness to join the desired class. The Senior class will not be organized till September, 1884.

TERMS AND VACATIONS.

The first term of 14 weeks begins September 18, and closes December 23, 1883; the second term of 13 weeks begins January 2, 1884, and closes March 30, 1884; the third term of 12 weeks begins April 9, 1884, and closes June 29, 1884. Vacations of one week

each occur after the first and second terms respectively, and of eleven weeks after the third term.

EXAMINATIONS.

All students are examined at least twice a year on the work of the year, and the result of these examinations determines their standing.

TUITION.

No charge for tuition is made to *bona fide* residents of Vigo County, Indiana. All others pay seventy-five dollars each per year. Every student, of whatever place of residence, pays an annual fee of twenty-five dollars for use of chemicals, breakage and contingencies. All bills for tuition and incidentals are payable in advance on the first day of each term.

BOARD.

No arrangements for board are made at the Institute. Students find excellent accommodations in private families at prices ranging from \$4.00 to \$5.00 per week.

All students who intend to apply for examination should make application in writing. *Letters seeking information about the Rose Polytechnic Institute, should be addressed to

PRES'T. CHARLES O. THOMPSON,

TERRE HAUTE, INDIANA.

*Until September 1st inquiries should be addressed to Samuel S. Early, Secretary, after that date to Pres't. Thompson.

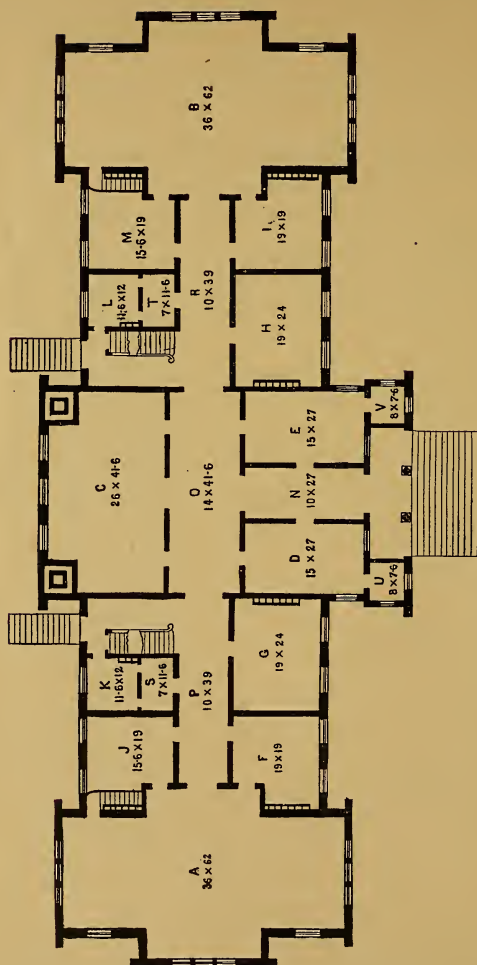
STUDENTS.

*FRESHMAN CLASS.

M. Department of Mechanics.

OSCAR BAUR,	M.	-	-	-	Terre Haute.
CHARLES C. BROKAW,	M.	-	-	-	Terre Haute.
JOHN T. CHAPPLE,	M.	-	-	-	Terre Haute.
WILLIAM H. COBURN,	M.	-	-	-	Indianapolis.
JOHN D. COLLETT,	M.	-	-	-	Newport.
ANDREW L. DU PUY,	M.	-	-	-	Louisville, Ky.
EDWARD C. ELDER,	M.	-	-	-	Indianapolis.
HERBERT W. FOLTZ,	M.	-	-	-	Indianapolis.
ARTHUR W. HEDGES,	M.	-	-	-	Clinton.
CLARENCE LAIRD,	M.	-	-	-	Rockport.
WESLEY C. MASTERSON,	M.	-	-	-	Terre Haute.
WILLIAM H. MCKEEN,	M.	-	-	-	Terre Haute.
FRANK B. MILLER,	M.	-	-	-	Terre Haute.
CHARLES PADDOCK,	M.	-	-	-	Terre Haute.
GEORGE W. PARKER,	M.	-	-	-	Terre Haute.
CLARK S. RIGBY,	M.	-	-	-	Brazil.
CHARLES M. C. SAMES,	M.	-	-	-	Rockford, Ill.
DAVY P. SANDERSON,	M.	-	-	-	Marshall, Ill.
CHARLES E. SCOTT,	M.	-	-	-	Terre Haute.
JAMES R. SEATH,	M.	-	-	-	Terre Haute.
WILL H. SHRADER,	M.	-	-	-	Terre Haute.
EDWARD H. SMITH,	M.	-	-	-	South Hadley, Mass.
LUCIEN M. SULLIVAN,	M.	-	-	-	Indianapolis.
EDWARD C. THURSTON,	M.	-	-	-	Indianapolis.
ADOLPH WEISS,	M.	-	-	-	Charleston, Ill.

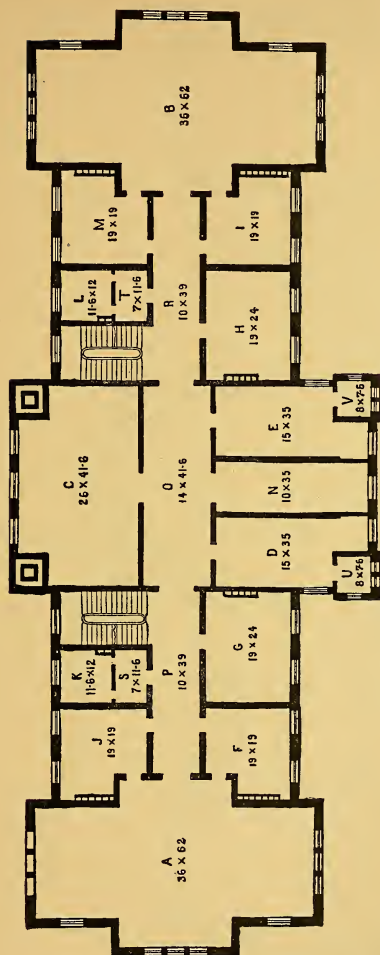
*This class, admitted March 6, 1883, with accessions from the September examination, will form the Sophomore class in 1883-84.



ACADEMIC BUILDING—FIRST FLOOR.

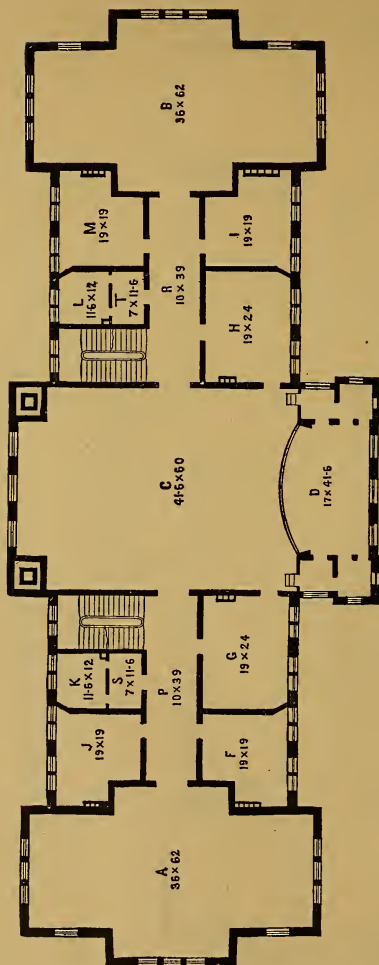
A, J, F—Library.
 B, I, M—Department of Mechanics.
 G, H—Recitation Rooms.
 C—Lecture Room.

D—President's Room.
 E—Rose Reception Room.
 K, L, S, T—Closets.
 P, O, R, N—Corridors.



ACADEMIC BUILDING—SECOND FLOOR.

A, J, F—Department of Physics.
 B, I, M—Department of Drawing.
 C—Department of Civil Engineering.
 E, D, G, H—Recitation Rooms.
 K, L, S, T, U, V—Closets.
 N—Hat and Coat Room.

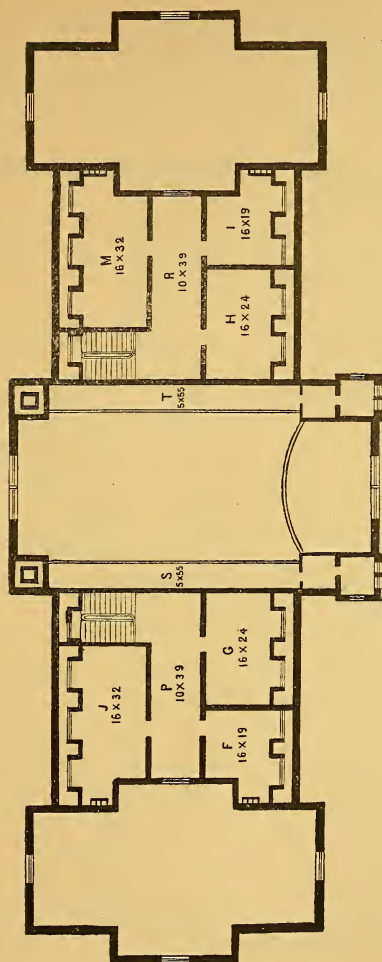


ACADEMIC BUILDING—THIRD FLOOR.

A, J, F—Mineralogy and Cabinet.
C, D—Chapel.

B—Museum of Mechanical Models.
K, L, S, T—Closets.

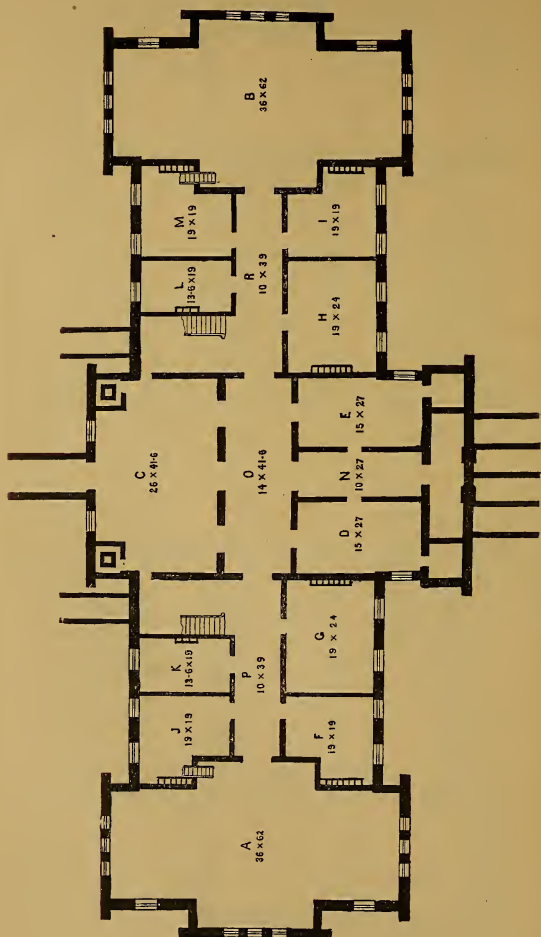
G, H, I, M—Recitation Rooms.



ACADEMIC BUILDING—FOURTH FLOOR.

M, J—Tank-rooms.

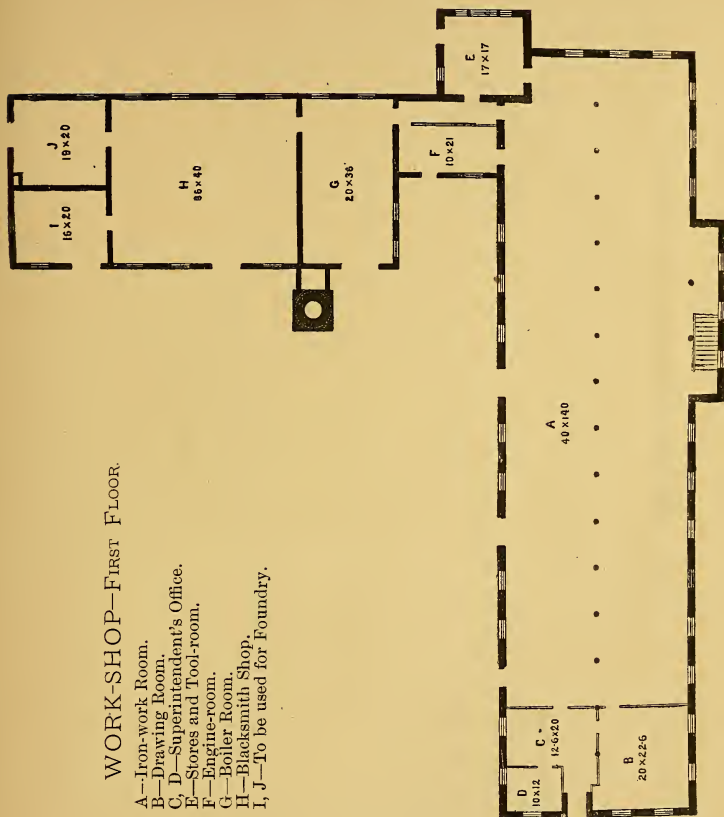
F, G, H, I—Store and Model Rooms.
S, T—Chapel Gallery.

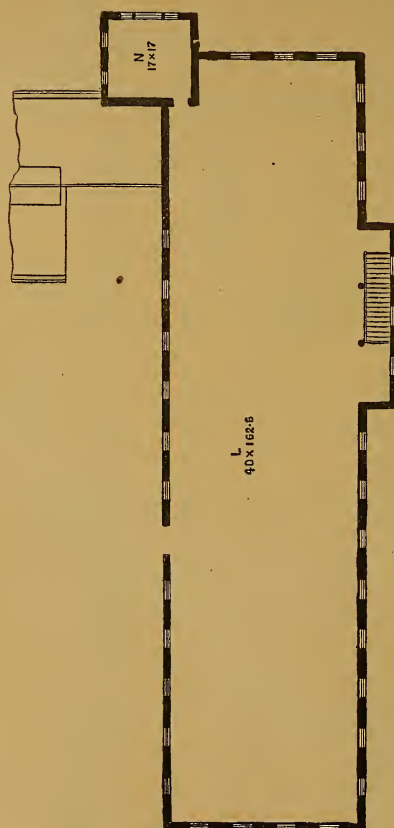


ACADEMIC BUILDING--BASEMENT.

WORK-SHOP—FIRST FLOOR.

- A—Iron-work Room.
 B—Drawing Room.
 C, D—Superintendent's Office.
 E—Stores and Tool-room.
 F—Engine-room.
 G—Boiler Room.
 H—Blacksmith Shop.
 I, J—To be used for Foundry.



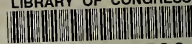


WORK-SHOP—SECOND FLOOR.

L—Wood-work Room. | N—Store-room.

Dimensions given in feet.

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